FIG. 1A

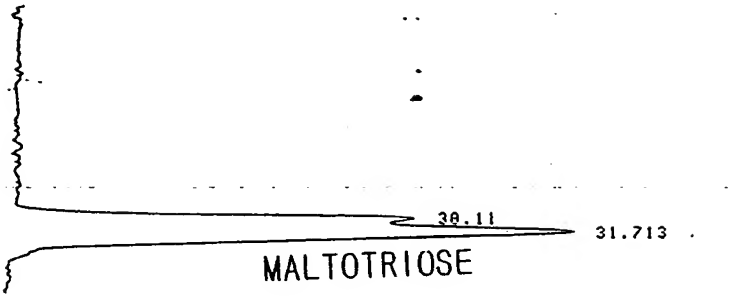
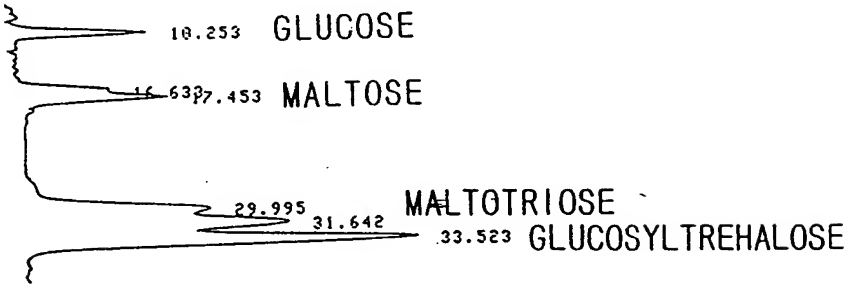

BEFORE REACTION
30.11
31.713
MALTOTRIOSE

FIG. 1B


AFTER REACTION
10.253 GLUCOSE
16.633 17.453 MALTOSE
29.995 MALTOTRIOSE
31.642
33.523 GLUCOSYLTREHALOSE

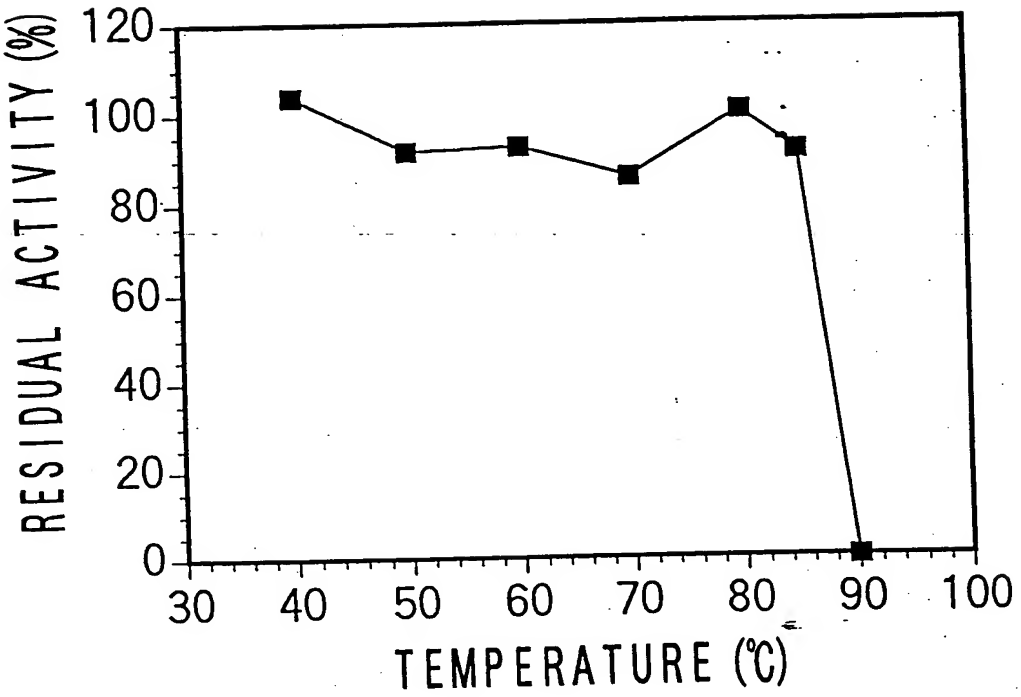

RESIDUAL ACTIVITY (%)
120
100
80
60
40
20
0
30
40
50
60
70
80
90
100
TEMPERATURE (℃)

FIG. 2

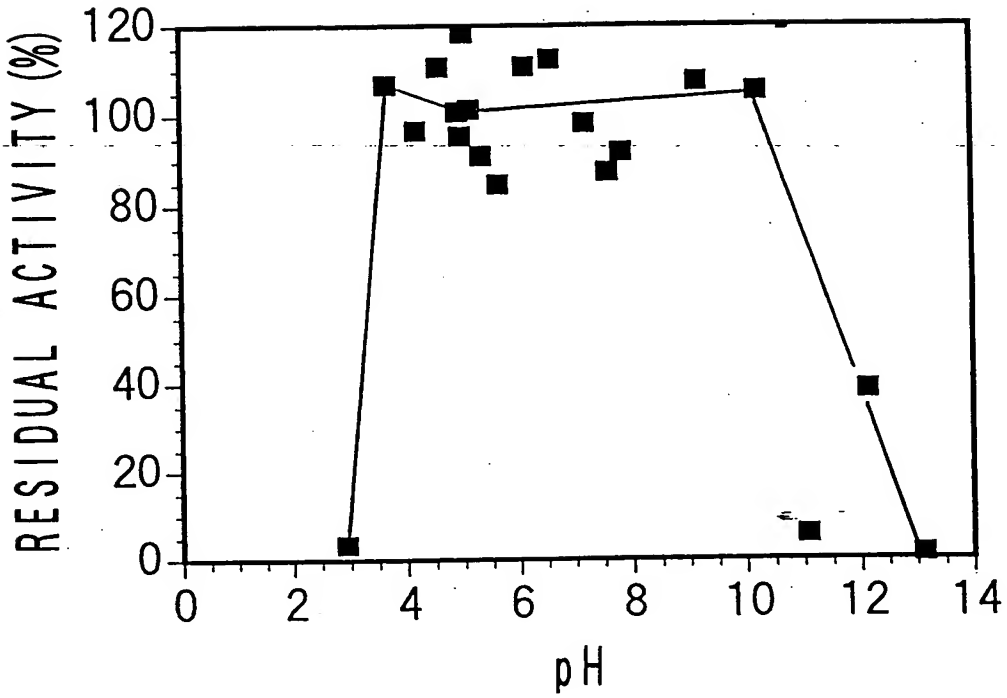


FIG. 3

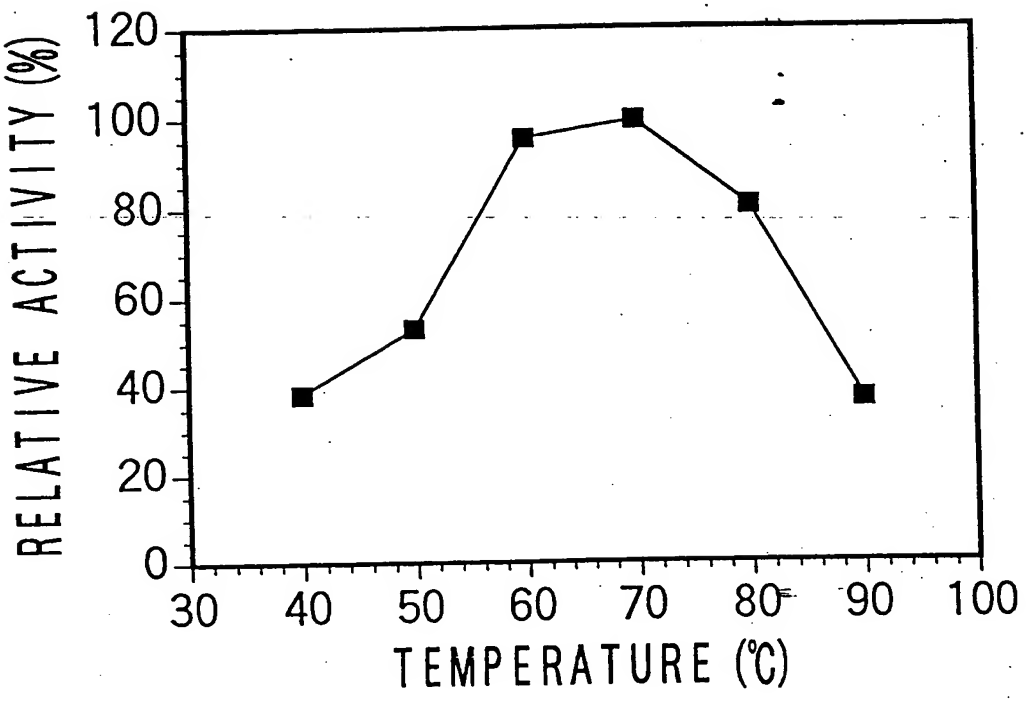

RELATIVE ACTIVITY (%)
120
100
80
60
40
20
0
30
40
50
60
70
80
90
100
TEMPERATURE (℃)

FIG. 4

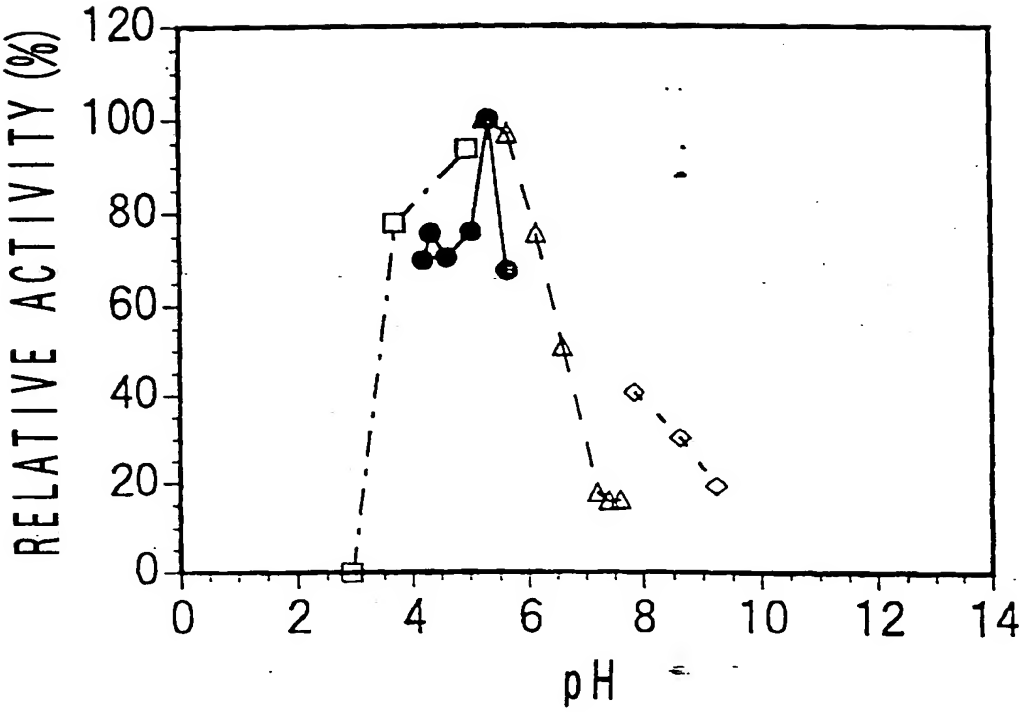


FIG. 5

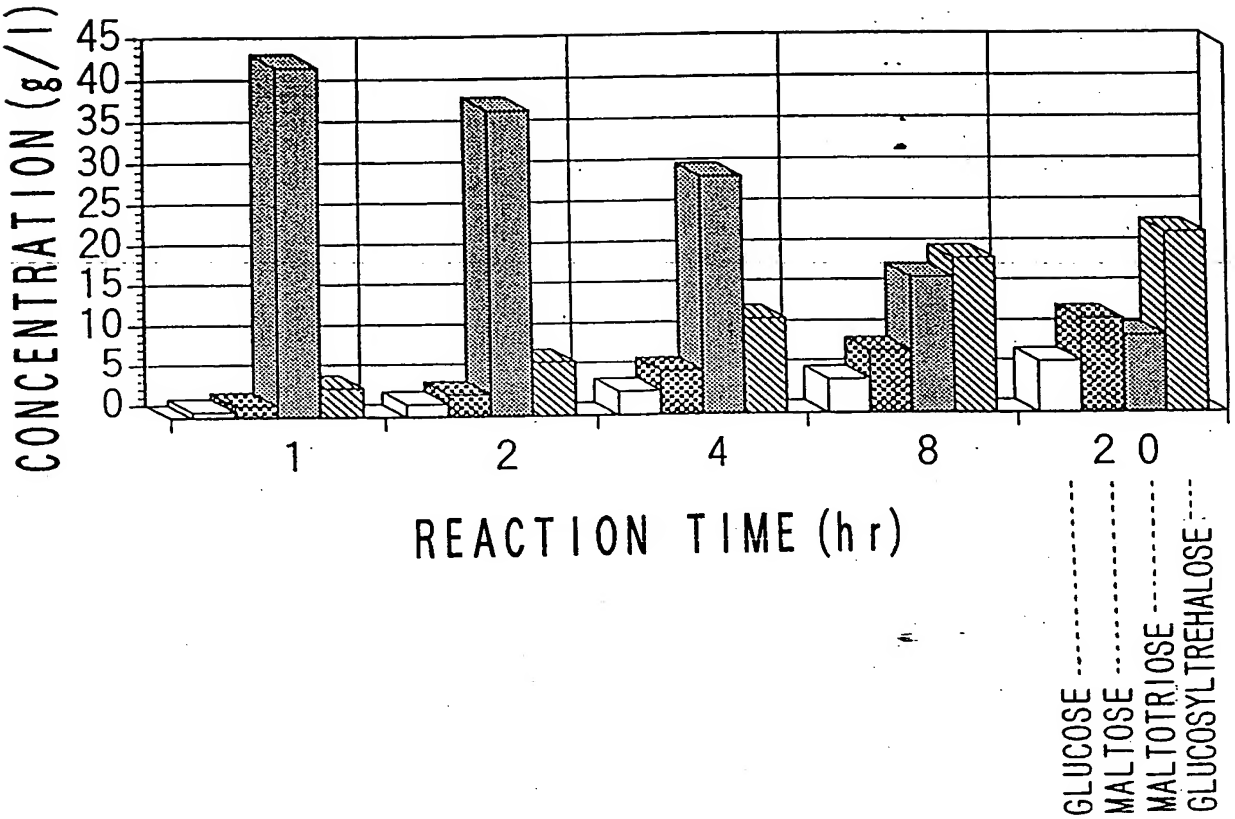

CONCENTRATION (g/l)
45
40
35
30
25
20
15
10
5
0
1
2
4
8
20
REACTION TIME (hr)
GLUCOSE
MALTOSE
MALTOTRIOSE
GLUCOSYLTREHALOSE

FIG. 6

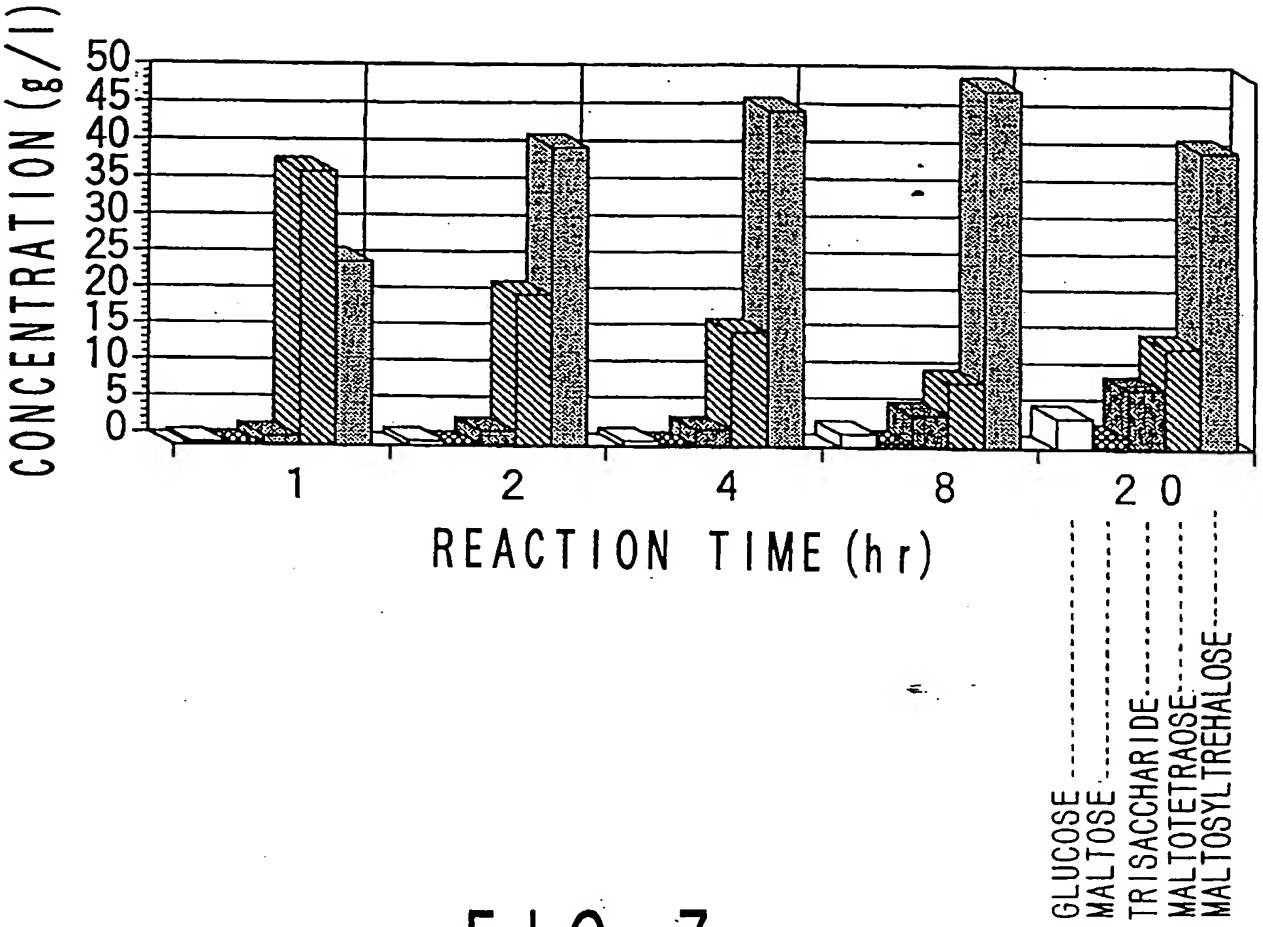

CONCENTRATION (g/l)
50
45
40
35
30
25
20
15
10
5
0
1
2
4
8
20
REACTION TIME (hr)
GLUCOSE
MALTOSE
TRISACCHARIDE
MALTOTETRAOSE
MALTOSYLTREHALOSE

FIG. 7

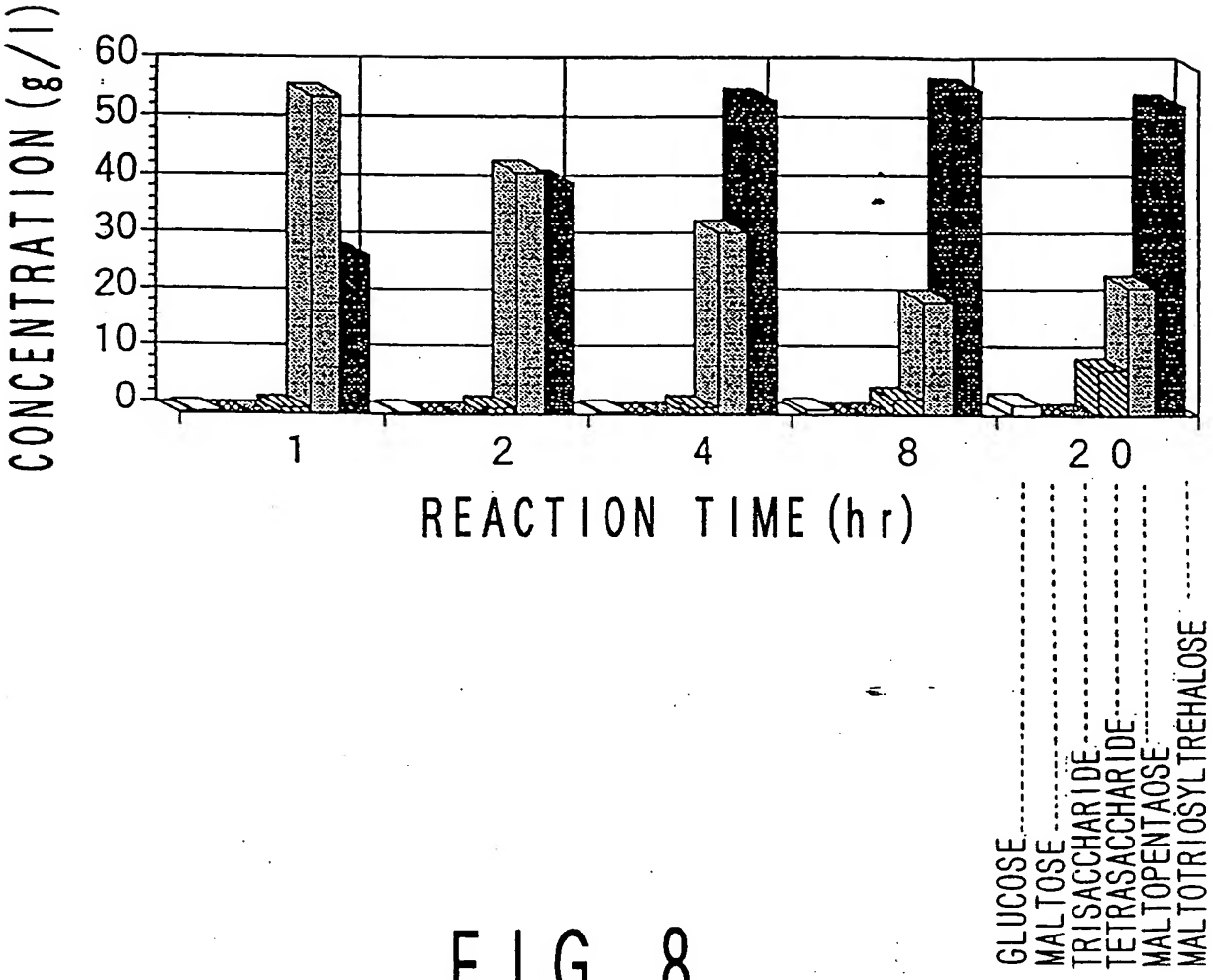

CONCENTRATION (g/l)
60
50
40
30
20
10
0
1
2
4
8
20
REACTION TIME (hr)
GLUCOSE
MALTOSE
TRISACCHARIDE
TETRASACCHARIDE
MALTOPENTAOSE
MALTOTRIOSYLTREHALOSE

FIG. 8

FIG. 9A

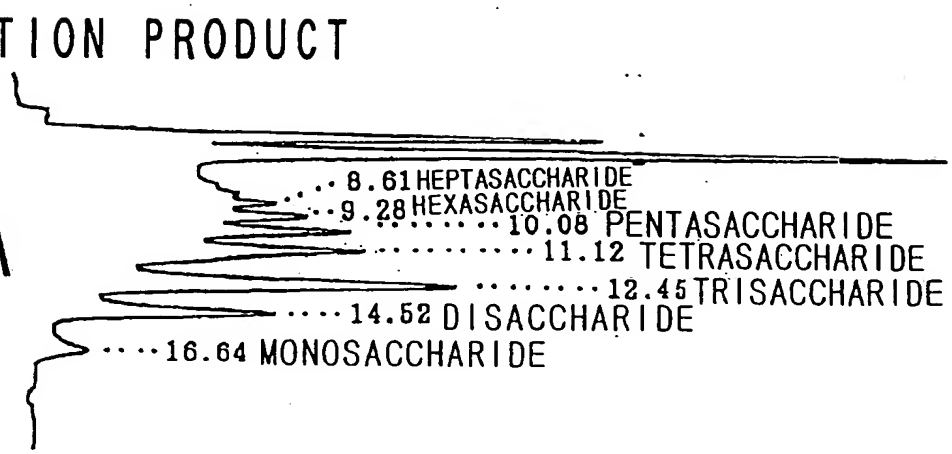
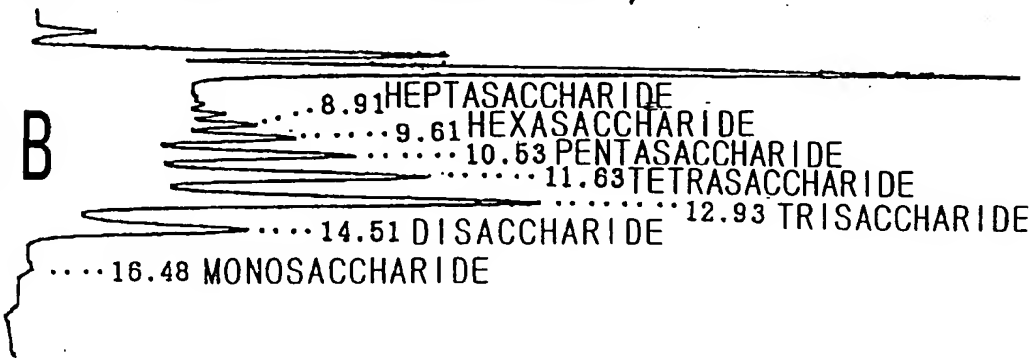

REACTION PRODUCT
8.61 HEPTASACCHARIDE
9.28 HEXASACCHARIDE
10.08 PENTASACCHARIDE
11.12 TETRASACCHARIDE
12.45 TRISACCHARIDE
14.52 DISACCHARIDE
16.64 MONOSACCHARIDE

FIG. 9B


CONTROL
(HYDROLYSATE ONLY BY AMYLASE)
8.91 HEPTASACCHARIDE
9.61 HEXASACCHARIDE
10.53 PENTASACCHARIDE
11.63 TETRASACCHARIDE
12.93 TRISACCHARIDE
14.51 DISACCHARIDE
16.48 MONOSACCHARIDE

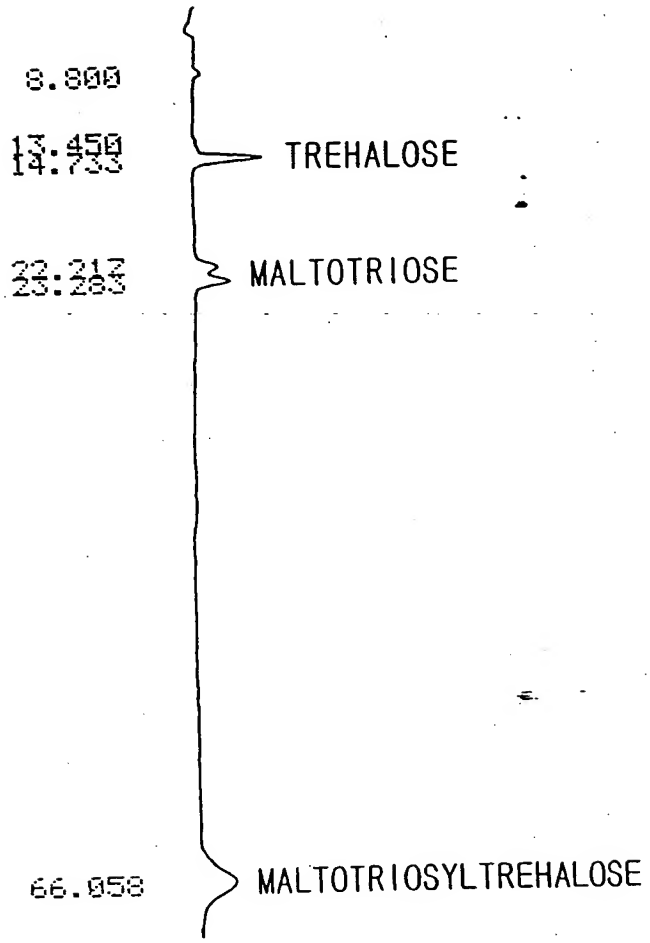

8.800
13.450
14.733
TREHALOSE
22.217
23.283
MALTOTRIOSE
66.058
MALTOTRIOSYLTREHALOSE

FIG. 10

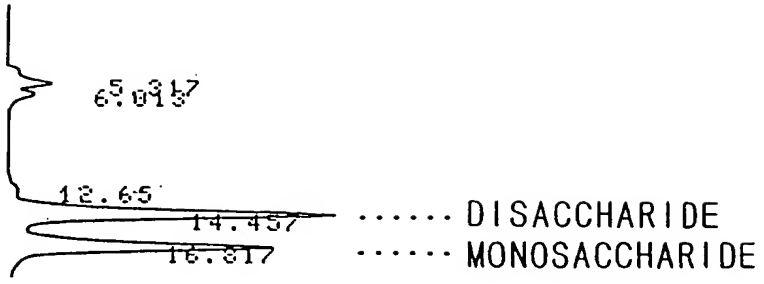


FIG. 11

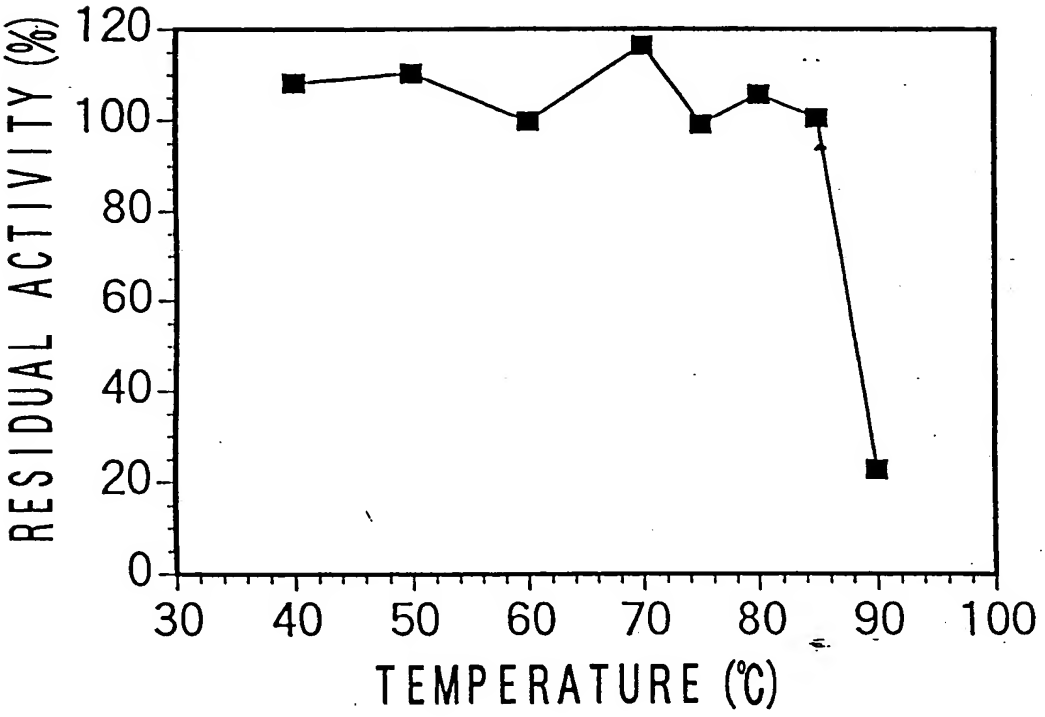

RESIDUAL ACTIVITY (%)
120
100
80
60
40
20
0
30
40
50
60
70
80
90
100
TEMPERATURE (℃)

FIG. 12

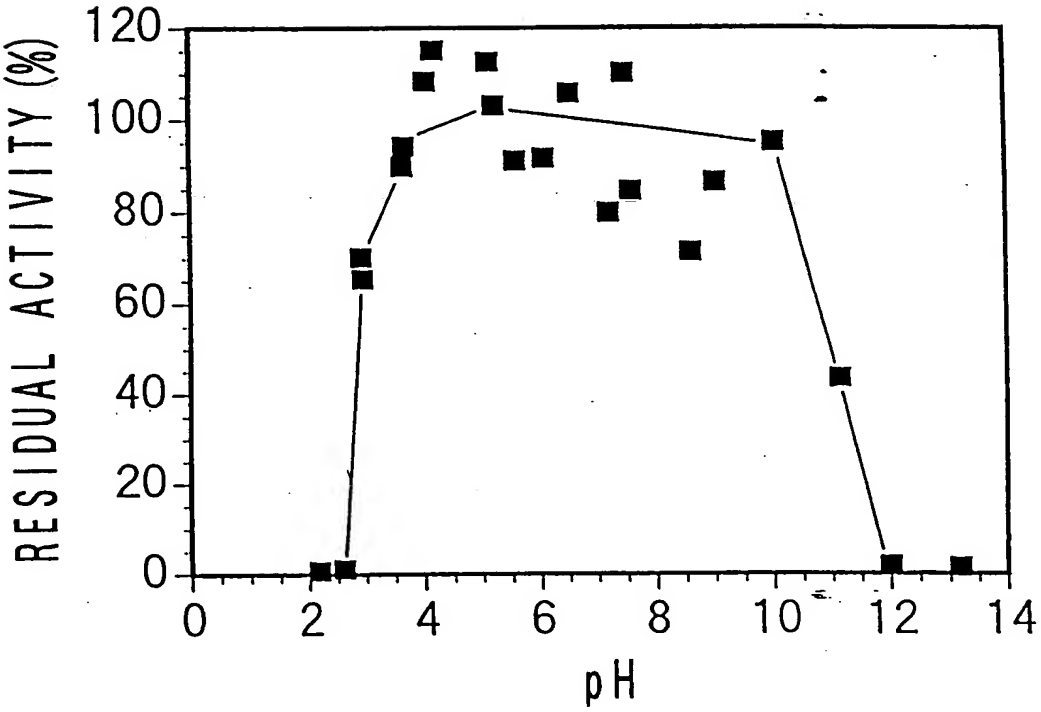


FIG. 13

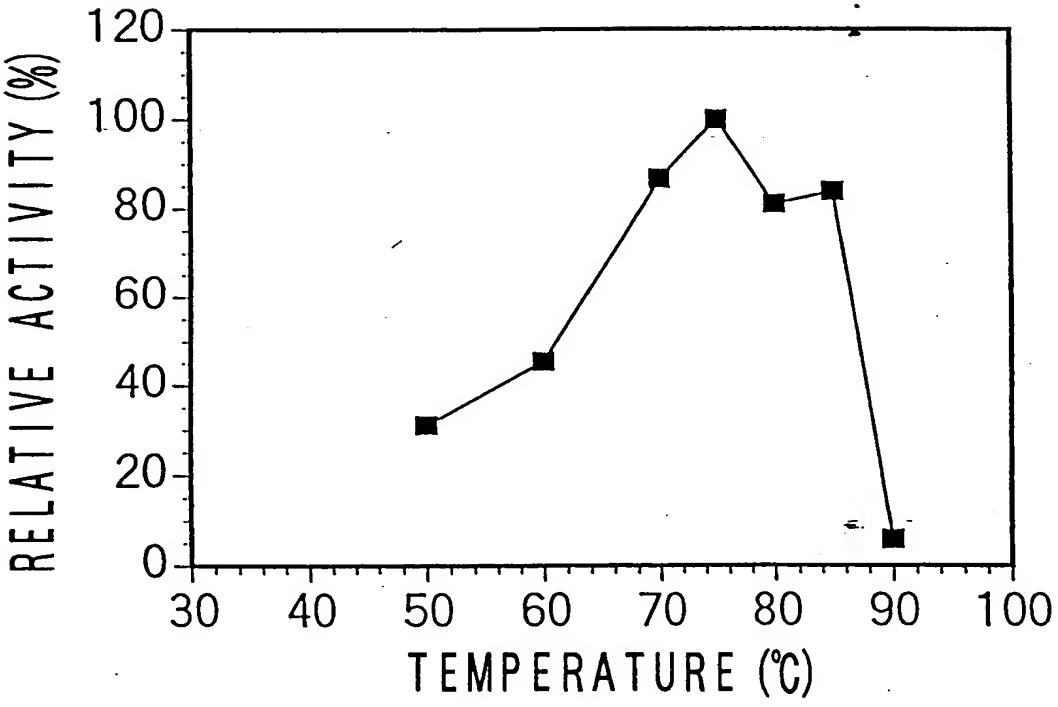

RELATIVE ACTIVITY (%)
120
100
80
60
40
20
0
30
40
50
60
70
80
90
100
TEMPERATURE (℃)

FIG. 14

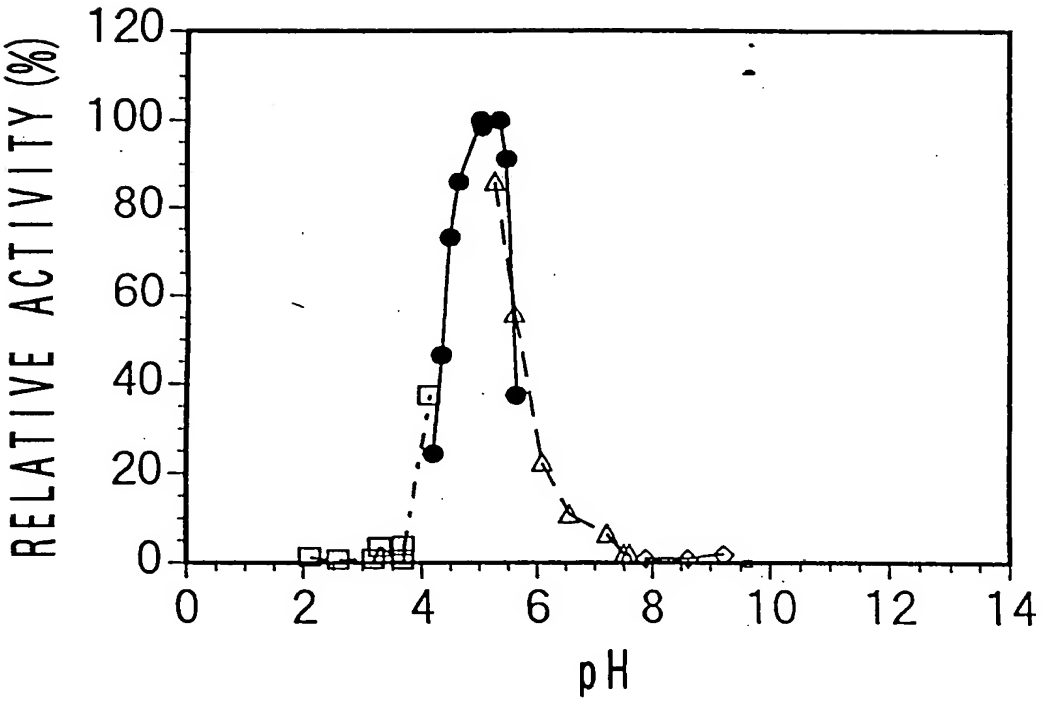


FIG. 15

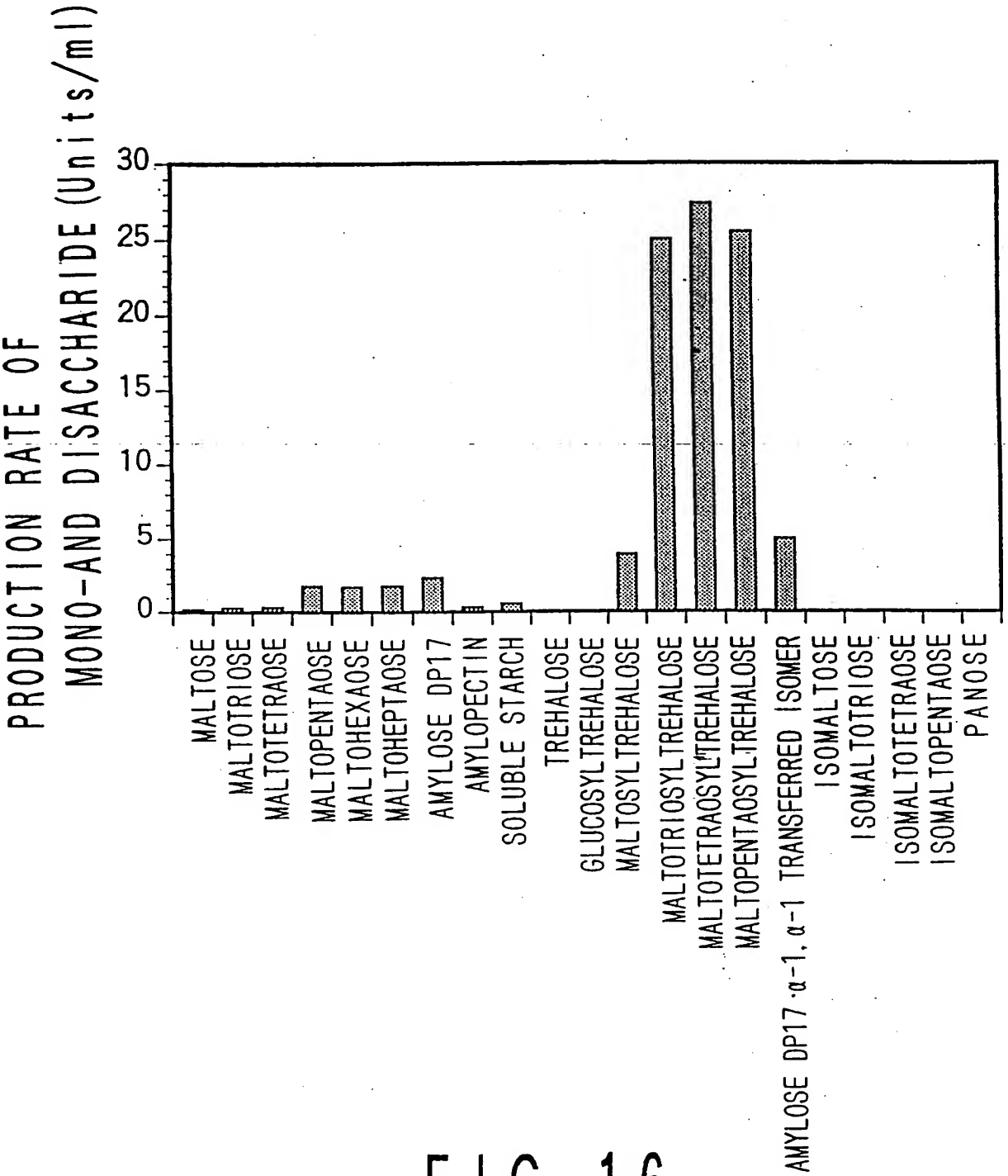

PRODUCTION RATE OF
MONO-AND DISACCHARIDE (Units/ml)
30
25
20
15
10
5
0
MALTOSE
MALTOTRIOSE
MALTOTETRAOSE
MALTOPENTAOSE
MALTOHEXAOSE
MALTOHEPTAOSE
AMYLOSE DP17
AMYLOPECTIN
SOLUBLE STARCH
TREHALOSE
GLUCOSYLTREHALOSE
MALTOSYLTREHALOSE
MALTOTRIOSYLTREHALOSE
MALTOTETRAOSYLTREHALOSE
MALTOPENTAOSYLTREHALOSE
AMYLOSE DP17 α-1, α-1 TRANSFERRED ISOMER
ISOMALTOSE
ISOMALTOTRIOSE
ISOMALTOTETRAOSE
ISOMALTOPENTAOSE
PANOSE

FIG. 16

FIG. 17A

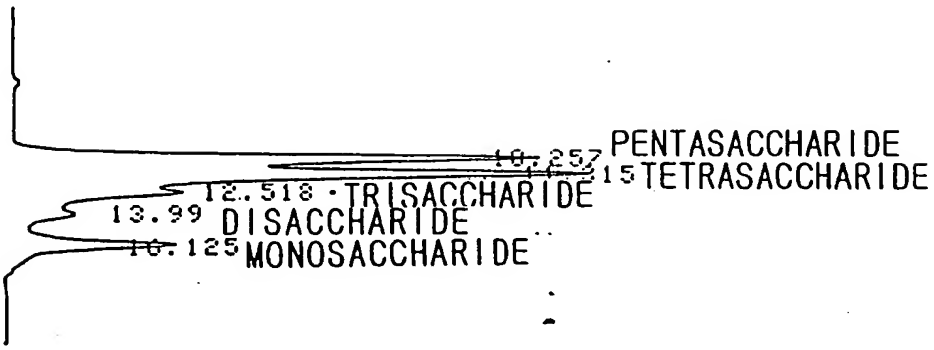


FIG. 17B

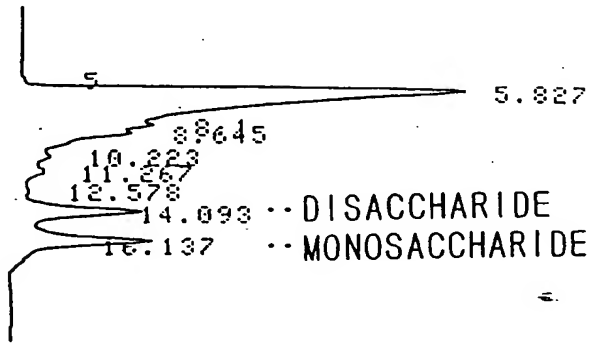
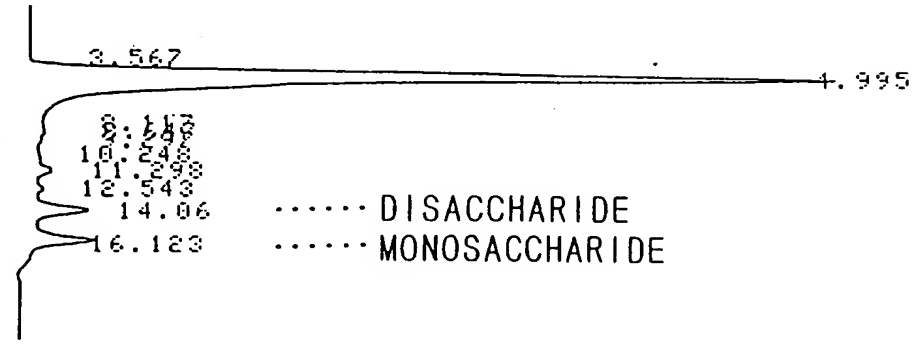


FIG. 17C



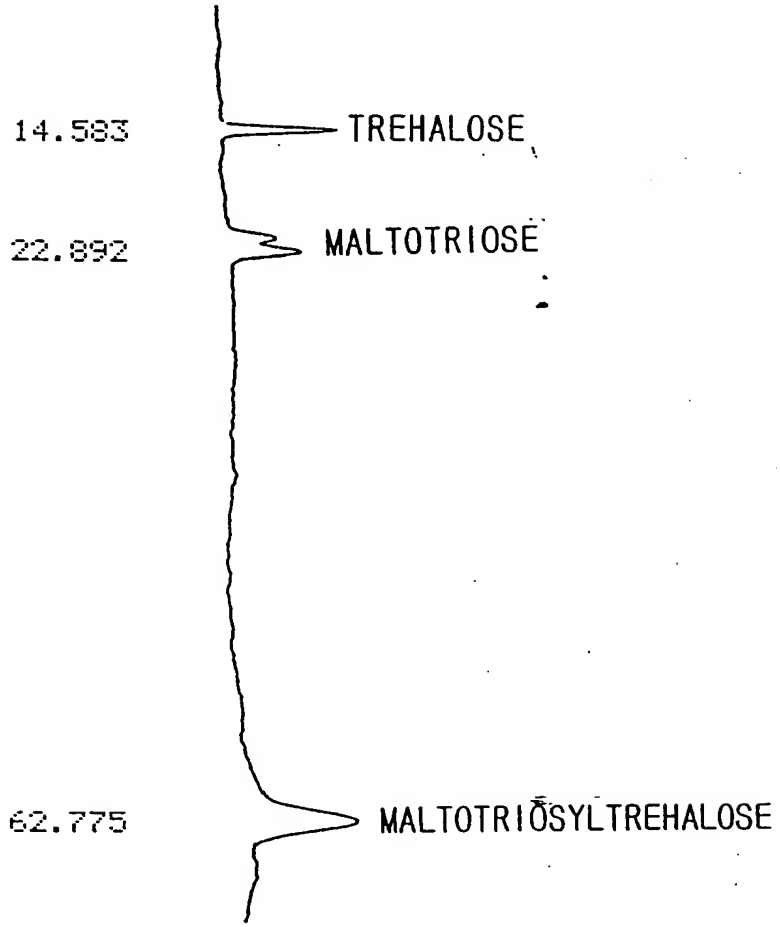

14.583
TREHALOSE
22.892
MALTOTRIOSE
62.775
MALTOTRIOSYLTREHALOSE

FIG. 18

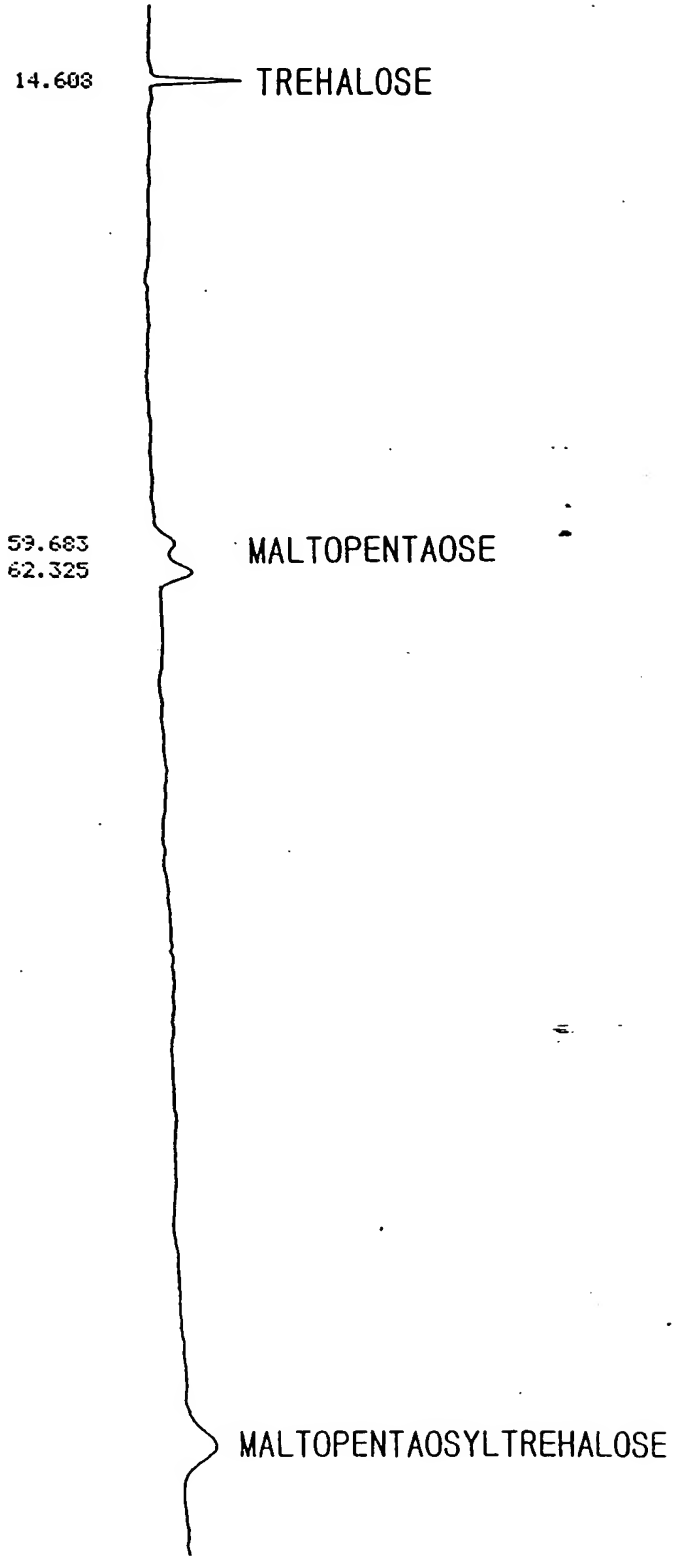

14.603
TREHALOSE
59.683
62.325
MALTOPENTAOSE
MALTOPENTAOSYLTREHALOSE

FIG. 19

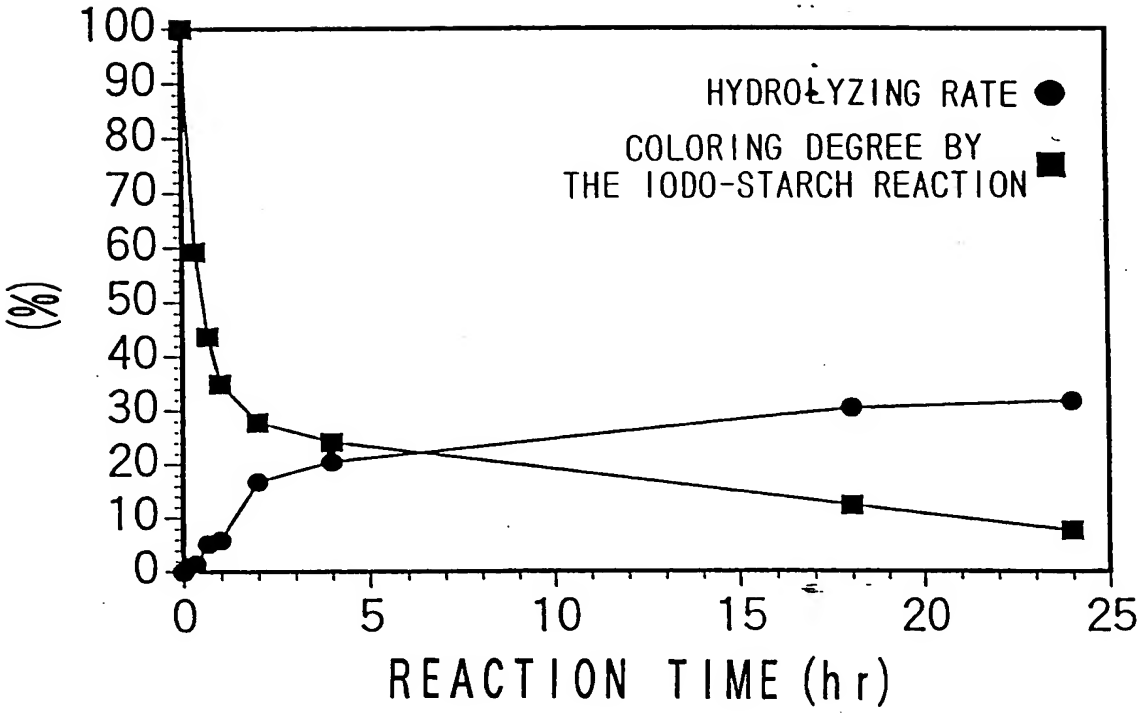

100
90
80
70
60
50
40
30
20
10
0
(%)
0
5
10
15
20
25
REACTION TIME (hr)
HYDROLYZING RATE
COLORING DEGREE BY
THE IODO-STARCH REACTION

FIG. 20

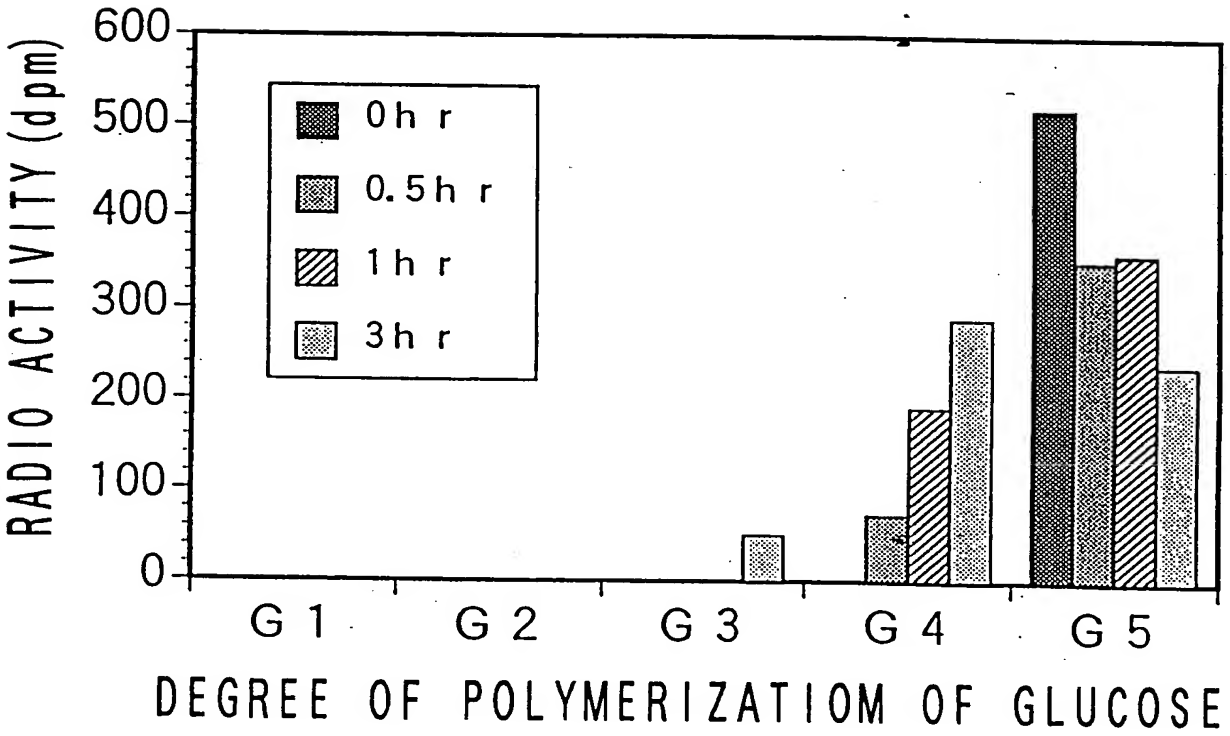

RADIO ACTIVITY (dpm)
600
500
400
300
200
100
0
0hr
0.5hr
1hr
3hr
G1
G2
G3
G4
G5
DEGREE OF POLYMERIZATIOM OF GLUCOSE

FIG. 21

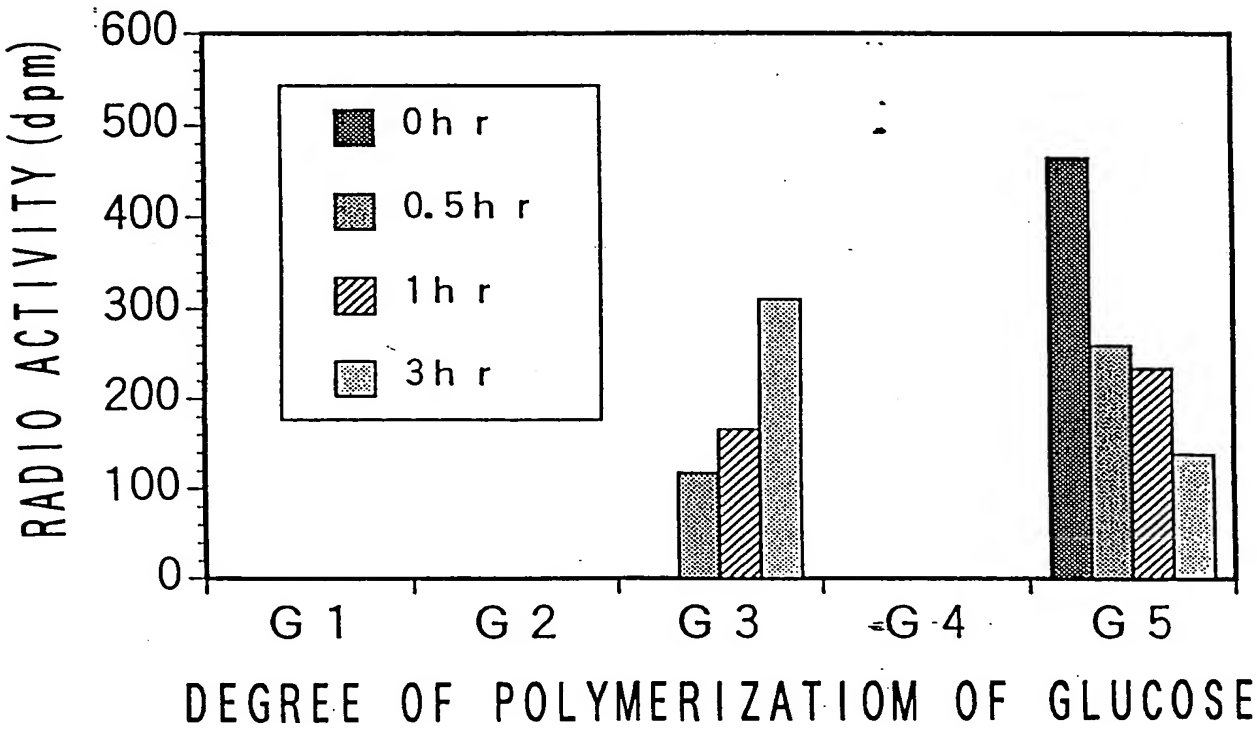

RADIO ACTIVITY (dpm)
600
500
400
300
200
100
0
0hr
0.5hr
1hr
3hr
G1
G2
G3
G4
G5
DEGREE OF POLYMERIZATIOM OF GLUCOSE

FIG. 22

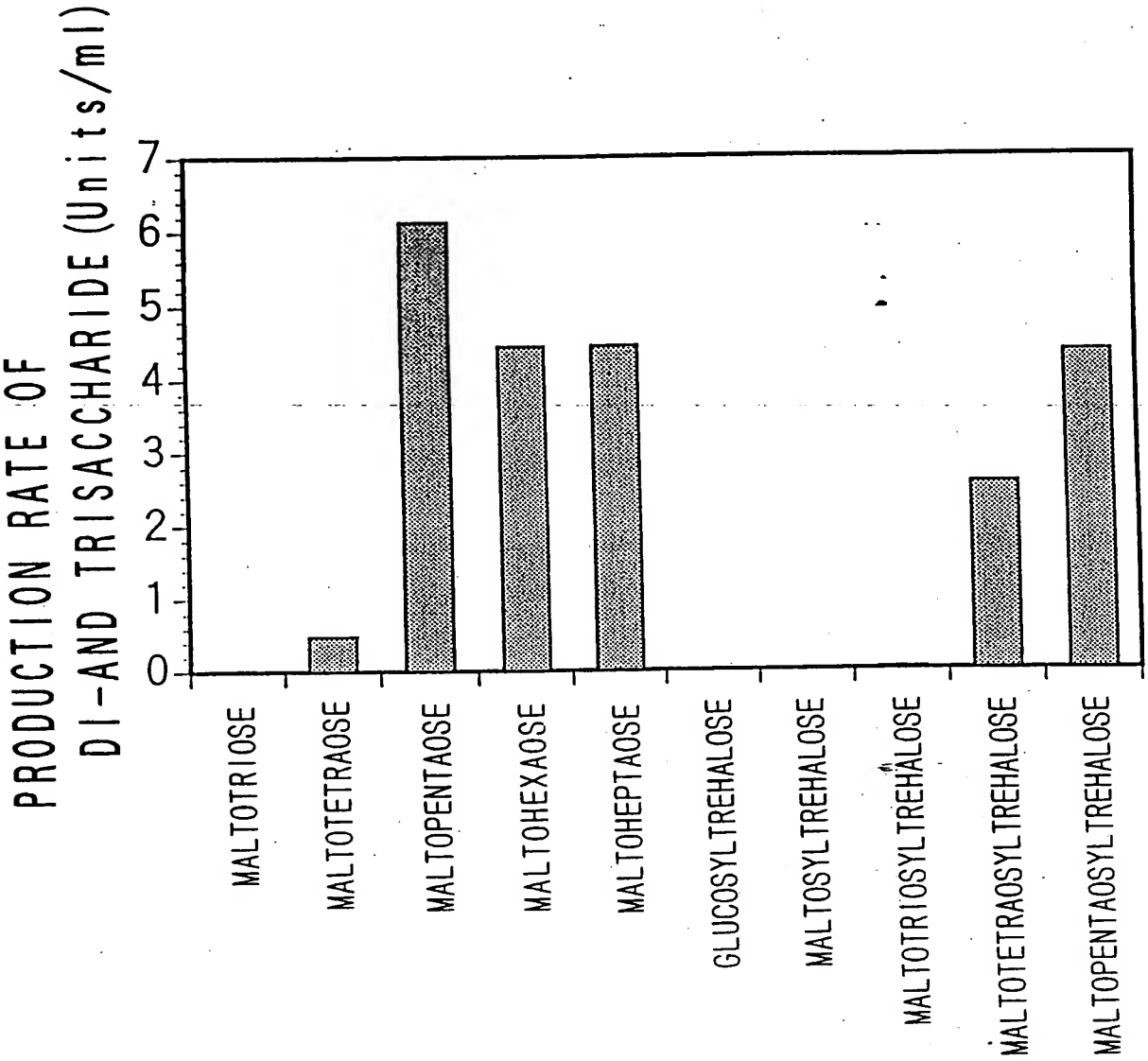

PRODUCTION RATE OF
DI-AND TRISACCHARIDE (Units/ml)
0
1
2
3
4
5
6
7
MALTOTRIOSE
MALTOTETRAOSE
MALTOPENTAOSE
MALTOHEXAOSE
MALTOHEPTAOSE
GLUCOSYLTREHALOSE
MALTOSYLTREHALOSE
MALTOTRIOSYLTREHALOSE
MALTOTETRAOSYLTREHALOSE
MALTOPENTAOSYLTREHALOSE

FIG. 23

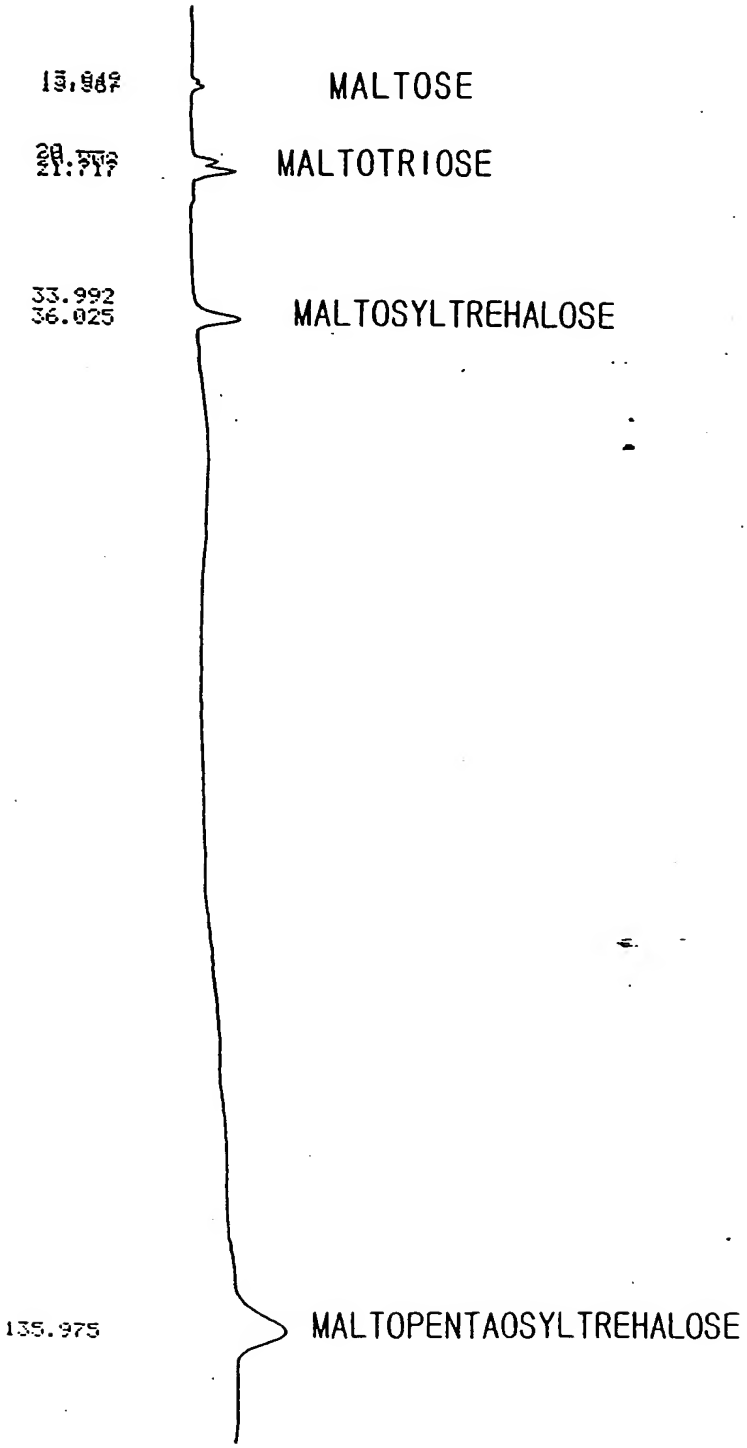

13.967
MALTOSE
20.992
21.717
MALTOTRIOSE
33.992
36.025
MALTOSYLTREHALOSE
135.975
MALTOPENTAOSYLTREHALOSE

FIG. 24

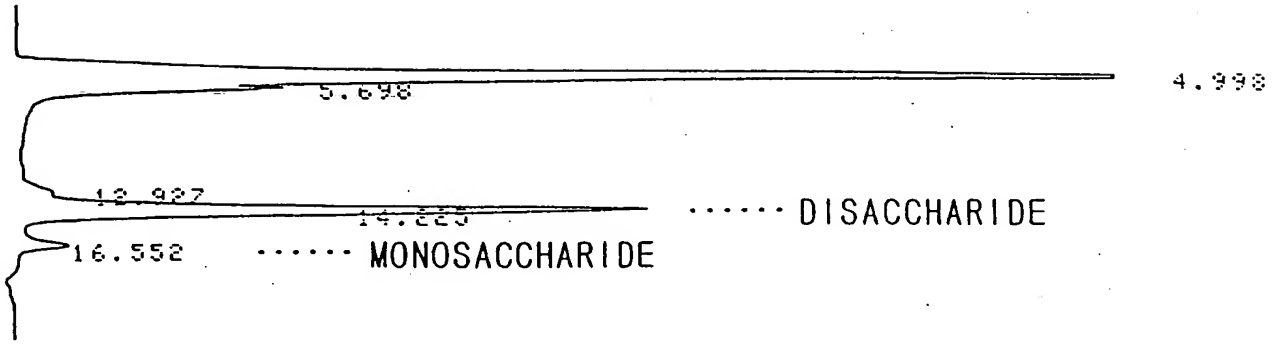
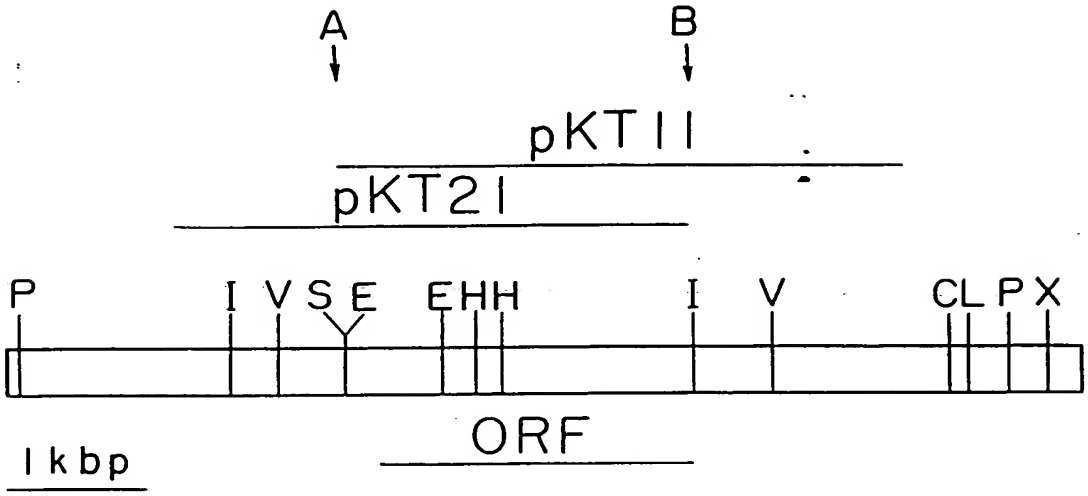


FIG. 25



P : Pst I
I : EcoT22I
V : EcoRV
S : Sph I
E : EcoR I
H : HincII
C : Sac I
L : Sal I
X : Xba I

FIG. 26

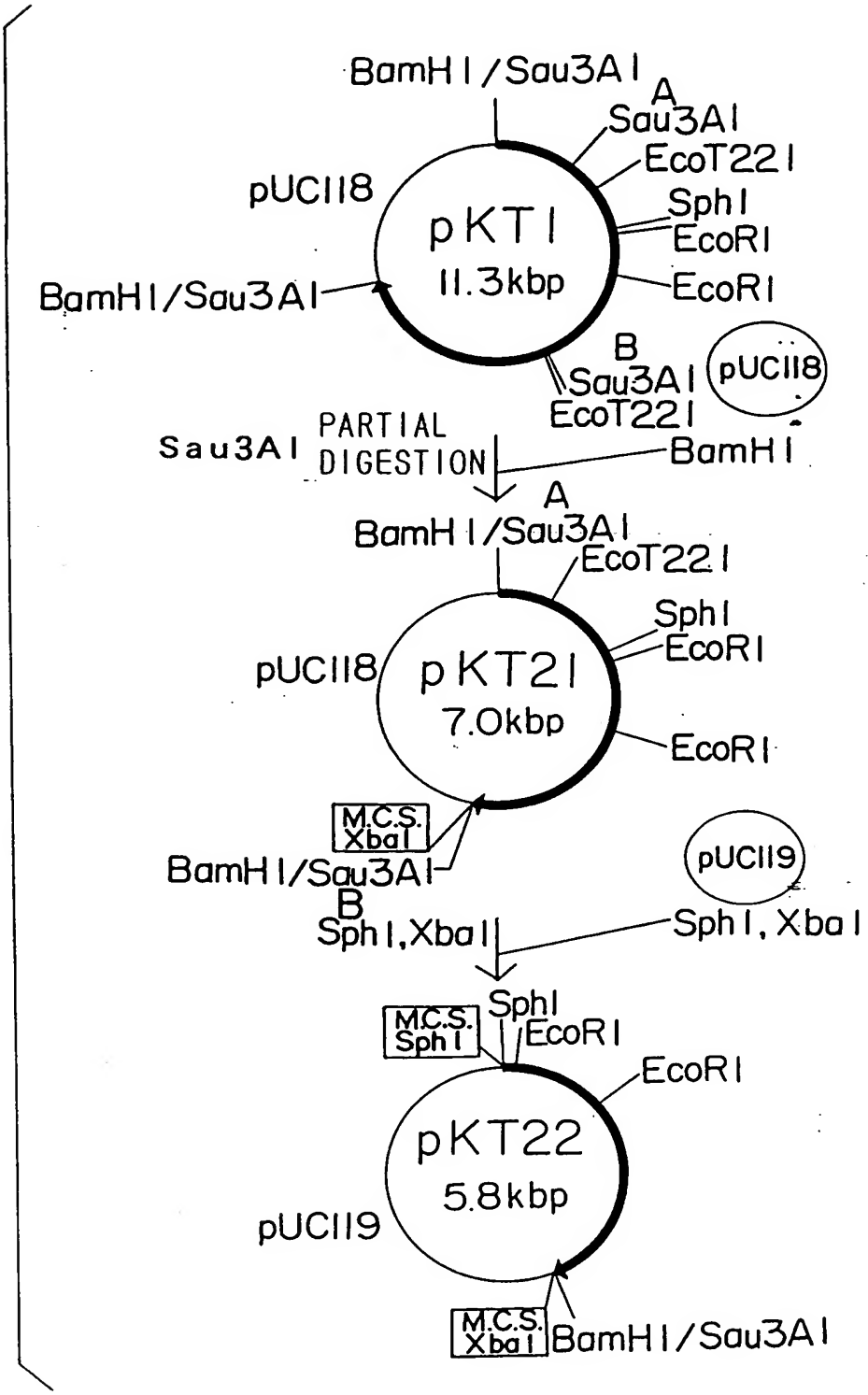
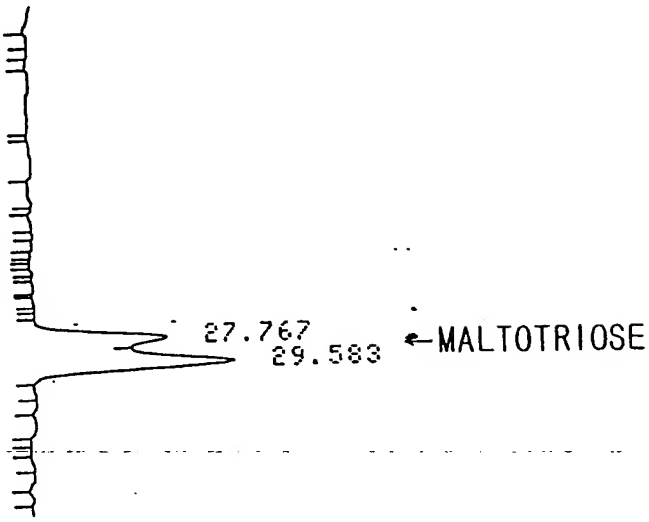

BamH I / Sau3A I
A
Sau3A I
EcoT22 I
pUC118
pKT1
11.3kbp
Sph I
EcoR I
BamH I / Sau3A I
EcoR I
B
Sau3A I
pUC118
EcoT22 I
Sau3A I
PARTIAL
DIGESTION
BamH I
A
BamH I / Sau3A I
EcoT22 I
Sph I
EcoR I
pUC118
pKT21
7.0kbp
EcoR I
M.C.S.
Xba I
BamH I / Sau3A I
pUC119
B
Sph I, Xba I
Sph I, Xba I
Sph I
M.C.S.
Sph I
EcoR I
EcoR I
pKT22
5.8kbp
pUC119
M.C.S.
Xba I
BamH I / Sau3A I

FIG. 27

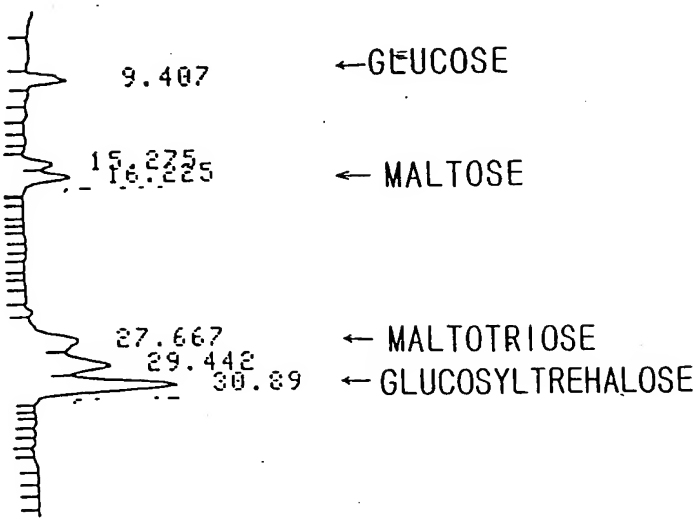
BEFORE ADDITION OF CRUDE ENZYME EXTRACT

FIG. 28A



AFTER ADDITION OF CRUDE ENZYME EXTRACT

FIG. 28B



p09T1 INSERTED FRAGMENT

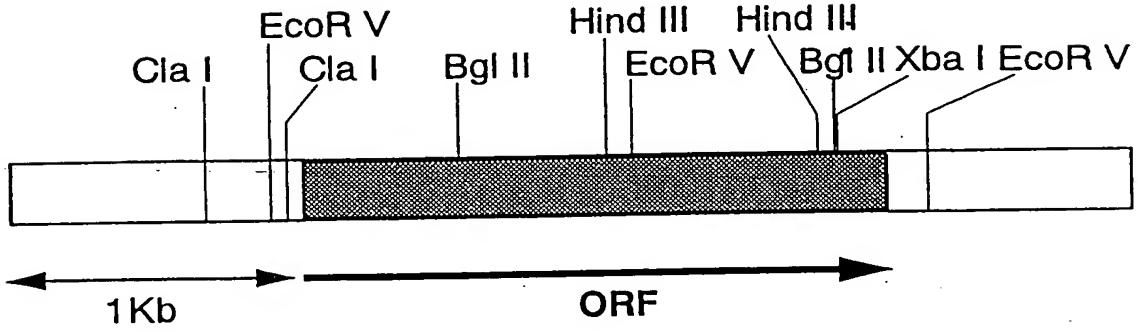
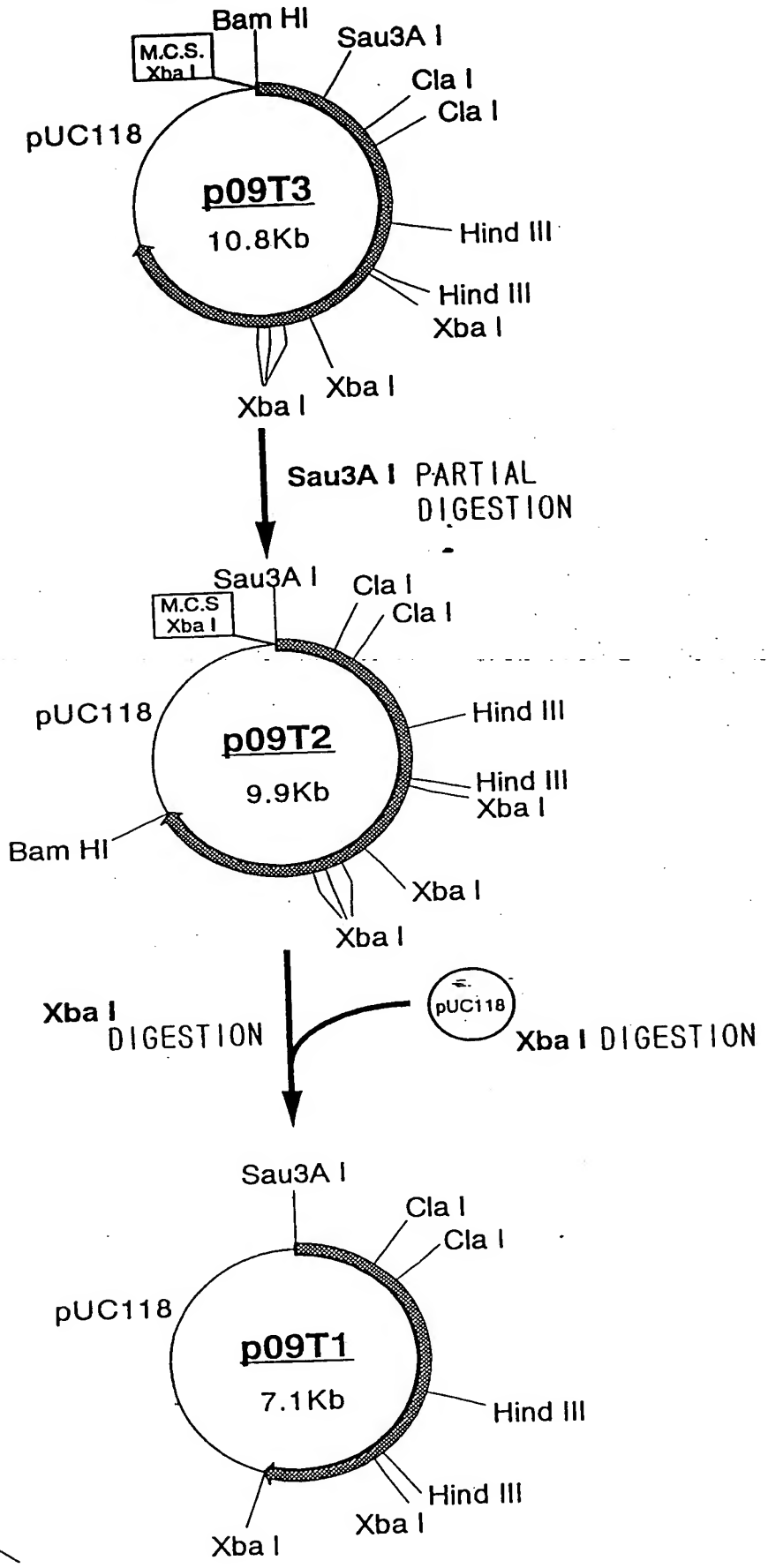


FIG. 29

FIG. 30


Bam HI
Sau3A I
M.C.S.
Xba I
Cla I
Cla I
pUC118
p09T3
10.8Kb
Hind III
Hind III
Xba I
Xba I
Xba I
Sau3A I PARTIAL DIGESTION
Sau3A I
Cla I
M.C.S
Xba I
Cla I
pUC118
p09T2
9.9Kb
Hind III
Hind III
Xba I
Bam HI
Xba I
Xba I
Xba I DIGESTION
pUC118
Xba I DIGESTION
Sau3A I
Cla I
Cla I
pUC118
p09T1
7.1Kb
Hind III
Hind III
Xba I
Xba I

```
1'                                                    MASPGSNHGYDVIDHSRIND
1" MIIGTYRLQLNKKFTFYDIIENLDYFKELGVSHLYLSPILKARPGSTHGYDVVDHSEINE
21' ELGGEKEYRRLIETAHTIGLGIIQDIVPNHMAVNSLNWRLMDVLKMGKKSKYYTYFDFFP
61" ELGGEEGCFKLVKEAKSRGLEIIQDIVPNHMAVHHTNWRLMDLLKSWKNSKYYNYFDHY-
81' EDDKIRLPILGEDLDTVISKGLLKIVKDGDEY----------FLEYFKWKLPLTE---VG
120" DDDKIILPILEDELDTVIDKGLIKLQKDNIEYRGLILPINDEGVEFLKRINCFDNSCLKK
128' NDIYDTLQKQNYTLMSWKNP-PSYRRFFDVNTLIGVNVEKDHVFQESHSKILDLDVDGYR
180" EDIKKLLLIQYYQLTYWKKGYPNYRRFFAVNDLIAVRVELDEVFRESHEIIAKLPVDGLR
187' IDHIDGLYDPEKYINDLRSII-KNKIIIVEKILGFQEELK--LNSDGTTGYDFLNYSNLL
240" IDHIDGLYNPKEYLDKLRQLVGNDKIIYVEKILSINEKLRDDWKVDGTTGYDFLNYVNML
244' F--NFNQEIMDSIYENFTAEKISISESIKKIKAQIIDELFSYEVKRLASQLGISYDILRD
300" LVDGSGEEELTKFYENFIGRKINIDELIIQSKKLVANQLFKGDIERLSKLLNVNYDYLVD
302' YLSCIDVYRTYANQIVKECDKTNEIEEATK-RNPEAYTKLQQYMPAVYAKAYEDTFLFRY
360" FLACMKKYRTY--LPYEDINGIRECDKEGKLKDEKGIMRLQQYMPAIFAKGYEDTTLFIY
361' NRLISINEVGSDLRYYKISPDQFHVFNQKRRGKITLNATSTHDTKFSEDVRMKISVLSEF
418" NRLISLNEVGSDLRRFSLSIKDFHNFNLSRVNTISMNTLSTHDTKFSEDVRARISVLSEI
421' PEEWKNKVEEWHSIINPKVSRNDEYRYYQVLVGSFYEGFSNDFKERIKQHMIKSVREAKI
478" PKEWEERVIYWHDLLRPNIDKNDEYRFYQTLVGS-YEGF--DNKERIKNHMIKVIREAKV
481' NTSWRNQNKEYENRVMELVEETFTNKDFIKSFMKFESKIRRIGMIKSLSLVALKIMSAGI
535" HTTWENPNIEYEKKVLGFIDEVFENSNFRNDFENFEKKIVYFGYMKSLIATTLRFLSPGV
541' PDFYQGTEIWRYLLTDPDNRVPVDFKKLHEILEKSKKFEKNMLESMDDGRIKMYLTYKLL
595" PDIYQGTEVWRFLLTDPDNRMPVDFKKLKELL---NNLTEKNLE-LSDPRVKMLYVKKLL
601' SLRKQLAEDFLKGEYKGLDLEEGLCGFIRFNKILVIIKTKGSVNYKLKLEEGAIYTDVLT
651" QLRR----EYSLNDYKPLPF-----GFQR-GKVAVLFSPIVTREVKEKISIRQKSVDWIR
661' GEEIKK-EVQINELPRILVRM
701" NEEISSGEYNLSELIGKHKVVILTEKRE
```

FIG. 31

```
816'                                ATGGCTTCGCCAGGAAGTA-ACCATGGGTACGATGTAA
                                    * **** **  * * **** * ***  **   **  *
455" AAGGCTAGACCAGGGAGCACTCACGGCTACG--ATGTAGTAGATCAT-AGTGAAATTAAT

853' TAGATCATTCAAGGATAAACGATGAAC-TTGGAGGAG---AGAAAGAATACAGGAGATTA
  **    *  **** **  *  *  * **  *  **   ** ***   * ** ***
512" GAGGAATTAGGAGGAGAAGAGGGGTGCTTTAAACTAGTTAAGGAAGCTAAGAGTAGAGGT

909' ATAGAGACAGCTCATACTATTGGATTAGGTATTAT-ACAGGACATAGTACCAAAT-CACA
  **** *     **  *** *   *  *   **  * * **** *** ** *  * *
572" TTAGAAATCATACAAGATATAGTGCCAAATCACATGGCGGTACATCATACTAATTGGAGA

967' TGGCTGTAAATTCTCTA-AATTGG-CGACTAATGGATGTATTAAAAATGGGTAAAAAGAG
      ** *  *  *  * * **** ** ** *  **    ***  **   * *  *
632" CTTATGGATCTGTTAAAGAGTTGGAAGAATAGTAAATACTATAACTATT-TTGATCACTA

1025' TAAATATTATACGTACTTTGACTTTTTCCCAGAAGATGA-TAAGATACGATTACCCATAT
   *  ** * * *   *  *    * * ** ** ** *  *****  **    * **
691" CGATGATGACAAGATAATCCTCCCAATACTTGAGGACGAGTTGGATACCGTT--ATAGAT

1084' TAGGAGAAGATTTAGATACAG--TGATAAGTAAAGGTTTATTAAAGATAGTAAAAGATGG
  ***   ***  *  *****  *****   *  **  *  *  * * .**  *  *
749" AAGGGATTGATAAAACTACAGAAGGATAATATAGAGTACAG-AGGGCTTATATTACCTAT

1142' AGATGAATATTTCCTAGAATATTTCAAATGGA--AACT--TCCTCTAACAGAGGTTGGAA
  * ****  *     * ****  ** *** *** ** *  *    ***   * ***  **
808" AAATGATGAAGGAGTTGAATTCTTGAAAAGGATTAATTGCTTTGATAATTCATGTTTAAA

1198' -----ATGATATATACGACACTTTACAAAAACAGAATTATACCCTAATGTCTTGGAA---
       * ****** *  *     **  ** *** *****  **** *  *****
868" GAAAGAGGATATAAAGAAATTACTATTAATACAATATTATCAGCTAACTTACTGGAAGAA

1250' AAATCCTCCTAGCTATAGACGATTCTTCGATGTTAATACTTTAATAGGAGTAAATGTCGA
  *  *  *** * ******  **** ****  ** ***  *** **** ** *  ** **
928" AGGTTATCCAAACTATAGGAGATTTTTCGCAGTAAATGATTTGATAGCTGTTAGGGTAGA

1310' AAAAGATCACGTATTTCAAGAGTCCCATTCAAAGATCTTAGATTTAGATGTTGATGGCTA
  *   *** * ******  **********   * **    *  **   ***** ** *
988" ATTGGATGAAGTATTTAGAGAGTCCCATGAGATAATTGCTAAGCTACCAGTTGACGGTTT

1370' TAGAATTGATCATATTGATGGATTATATGATCCTGAGAAATATATTAATGACCT--GA-G
  ******** ** ** ****** ***** * *** ** * *** *  ** * **  **
1048" AAGAATTGACCACATAGATGGACTATATAACCCTAAGGAGTATTTAGATAAGCTAAGACA

1427' GTCAATAATTAAAAATAAAATAATTATTGTAGAAAAAATTCTGGGATTTCAGGAGGAATT
  ** * **   **  **** *****     ***** ** **  **  * *  * *** ****
1108" GTTAGTAGGAAATGATAAGATAATATACGTAGAGAAGATATTGTCAATCAACGAGAAATT

1487' AA------AATTAAATTCAGATGGAACTACAGGATATGACTTCTTAAATTACTCCAACTT
  **      * *  **   ****** ***** ******** ***** ** ***   **  *
1168" AAGAGATGATTGGAAAGTAGATGGGACTACTGGATATGATTTCTTGAACTACGTTAATAT

1541' ACTGTT--TA-ATTTTAATCAAGA-GA-TAATGGAC-AGTATATATGAGAATTTCACAGC
  ** **  ** **   * *   ** **  * *  ** *   * ************  *
1228" GCTATTAGTAGATGGAAGTGGTGAGGAGGAGTTAACTAAGTTTTATGAGAATTTCATTGG

1595' GGAGAAAATATCTATAAGTGAAAGTATAAAGAAAATAAAAGCGCAAATAATTGATGAGCT
     ******   ****   **   ****  ***  ***     * *     ** ** *
1288" AAGGAAAATCAATATAGACGAGTTAATAATACAAAGTAAAAAATTAGTTGCAAATCAGTT

1655' ATTTAGTTATGAAGTTAAAAGATTAGCATCACAACTAGGAATTAGCTACGATATATTGAG
  *****   ***  ** ********      ***     ***  ****** **** **
1348" ATTTAAAGGTGACATTGAAAGATTAAGCAAGTTACTGAACGTTAATTACGAT-TATTTAG

1715' -AGATTACCTTTCTTGTATAGATGTGTACAGAACTTATGCTAATCAGAT-TGTAAAAGAG
  *****  **  * *****  *    ***** ******  * * ** **  * * *  *
1407" TAGATTTTCTAGCATGTATGAAAAAATACAGGACTTAT--TTACCATATGAGGATATTAA
```

FIG. 32A

```
1773' TGTGATAAGACCAATGAGATAGAGGAAGCAACCAAAAGAAATCCAGAGGCTTATACTAAA
1465" CGGAATAAG-GGAATGCGATA-AGGAGGGAAAGTTAAAAGATGAAAAGGGAATCATGAGA

1833' TTACAACAATATATGCCAGCAGTATACGCTAAAGCTTATGAAGATACTTTCCTCTTTAGA
1523" CTCCAACAATACATGCCAGCAATCTTCGCTAAGGGCTATGAGGATACTACCCTCTTCATC

1893' TACAATAGATTAATATCCATAAATGAGGTTGGAAGCGATTTACGATATTATAAGATATCG
1583" TACAATAGATTAATTTCCCTTAACGAGGTTGGGAGCGACCTAAGA-AGATTCAGTTTAAG

1953' CCT-GATCAGTTTCATGTATTTAATCAAAAACGAAGAGGAAAAATCACACTAAATGCCAC
1642" CATCAAAGACTTTCATAACTTTAACCTAAGCAGAGTAAATACCATATCAATGAACACTCT

2012' TAGCACACATGATACTAAGTTTAGTGAAGATGTAAGGATGAAAATAAGTGTATTAAGTGA
1702" TTCCACTCATGATACTAAATTCAGTGAAGACGTTAGAGCTAGAATATCAGTACTATCTGA

2072' ATTTCCTGAAGAATGGAAAAATAAGGTCGAGGAATGGCATAGTATCATAAATCCAAAGGT
1762" GATACCAAAGGAGTGGGAGGAGAGGGTAATATACTGGCATGATTTGTTAAGGCCAAATAT

2132' ATCAAGAAATGATGAATATAGATATTATCAGGTTTTAGTGGGAAGTTTTTATGAGGGATT
1822" TGATAAAAACGATGAGTATAGATTTTATCAAACACTTGTGGGAAG---TTACGAGGGATT

2192' CTCTAATGATTTTAAGGAGAGAATAAAGCAACATATGATAAAAAGTGTCAGAGAAGCTAA
1879" ----T--GATAATAAGGAGAGAATTAAGAACCACATGATTAAGGTCATAAGAGAAGCTAA

2252' GATAAATACCTCATGGAGAAATCAAAATAAAGAATATGAAAATAGAGTAATGGAATTAGT
1933" GGTACATACAACGTGGGAAAATCCTAATATAGAGTATGAAAAGAAGGTTCTGGGTTTCAT

2312' GGAAGAAACTTTTACCAATAAGGATTTCATTAAAAGTTTCATGAAATTTGAAAGTAAGAT
1993" AGATGAAGTGTTCGAGAACAGTAATTTTAGAAATGATTTTGAAAATTTTGAAAAGAAAAT

2372' AAGAAGGATAGGGATGATTAAGAGCTTATCCTTGGTCGCATTAAAAATTATGTCAGCCGG
2053" AGTTTATTTCGGTTATATGAAATCATTAATCGCAACGACACTTAGGTTCCTTTCGCCCGG

2432' TATACCTGATTTTTATCAGGGAACAGAAATATGGCGATATTTACTTACAGATCCAGATAA
2113" TGTACCAGATATTTATCAAGGAACTGAAGTTTGGAGATTCTTACTTACAGACCCAGATAA

2492' CAGAGTCCCAGTGGATTTTAAGAAATTACACGAAATATTAGAAAAATCCAAAAAATTTGA
2173" CAGAATGCCGGTGGATTTCAAGAAACTAAAGGAATTATTAAATAATTTGACTGAAAAGAA

2552' AAAAAATATGTTAGAGTCTATGGAC--GATGGAAGA-ATTAAGATGTATTTAACATATAA
2233" CTTAGAACTCTCAGATCCAAGAGTCAAAATGTTATATGTTAAGAAAT-TGCTACAGCTTA

2609' GCTTTTATCCCTAAGAAAACAGTTGGCTGAGGATTTTTTAAAGGGCGAGTATAAGGG---
2292" GAAGAGAGTACTCACTAAACGATT--ATAAACCATTGCCCTTTGGCTTCCAAAGGGGAAA

2656' ATTAGATCTAGAAGAAGGACTATGTGGGTTTA-TTAGGTTTAACAAAATTTTGGTAATAA
2350" AGTAGCTGTCCTTTTCTCACCAATAGTGACTAGGGAGGTTAAAGAGAAAATTAGT-ATAA

2725' TAAAAACCAAGGGAAGTGTTAATTACAAACTGAAACTTGAAGAGGGAGCAATTTACACAG
2409" GGCAAA-AAAGCGTTGATTGGATCAGAAATGAGGAAATTAGTAGTGGAGAAT----ACAA

2785' ATGTATTGACAGGAGAAGAAATTAAAAAAGAGGTACAGATTAATGAGCTACCTAGGATAC
2464" TTTAAGTGAGTTGATTGGGAAGCATAAAGTCGTTATA-TTAACTGAAAAAAGGGAG
```

FIG. 32B

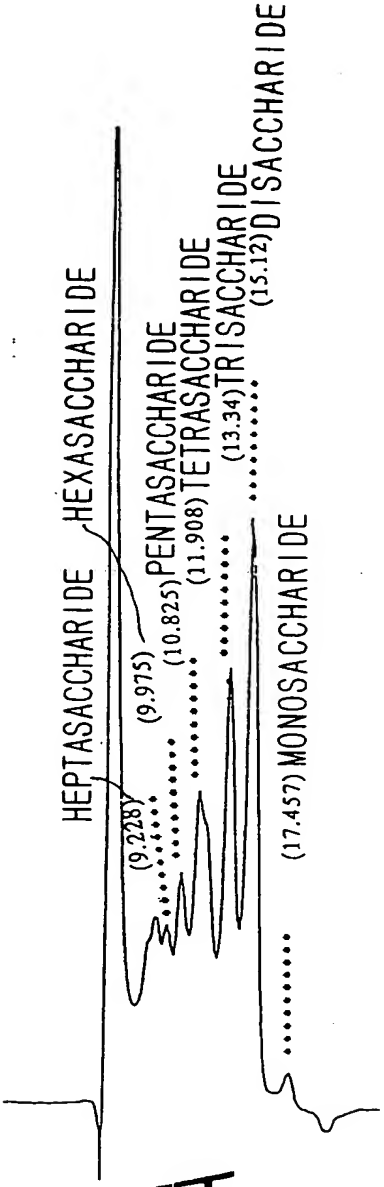


FIG. 33A

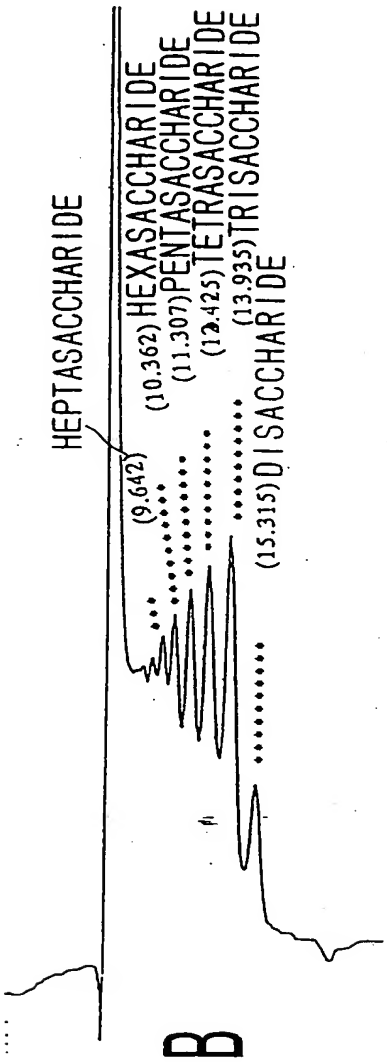
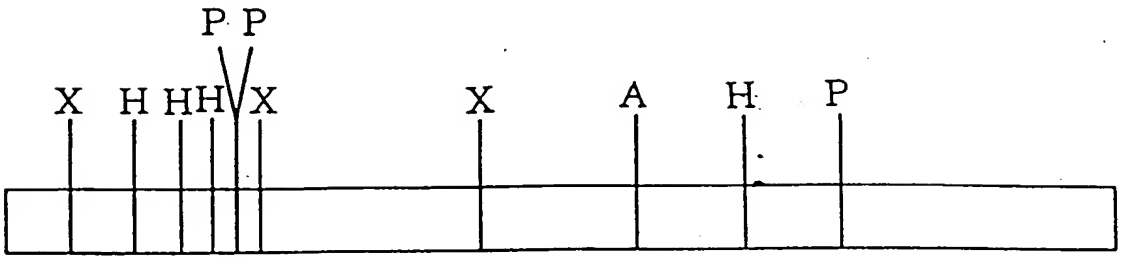


FIG. 33B



pKA2

A : Acc I
H : Hinc II
P : Pst I
X : Xba I

FIG. 34

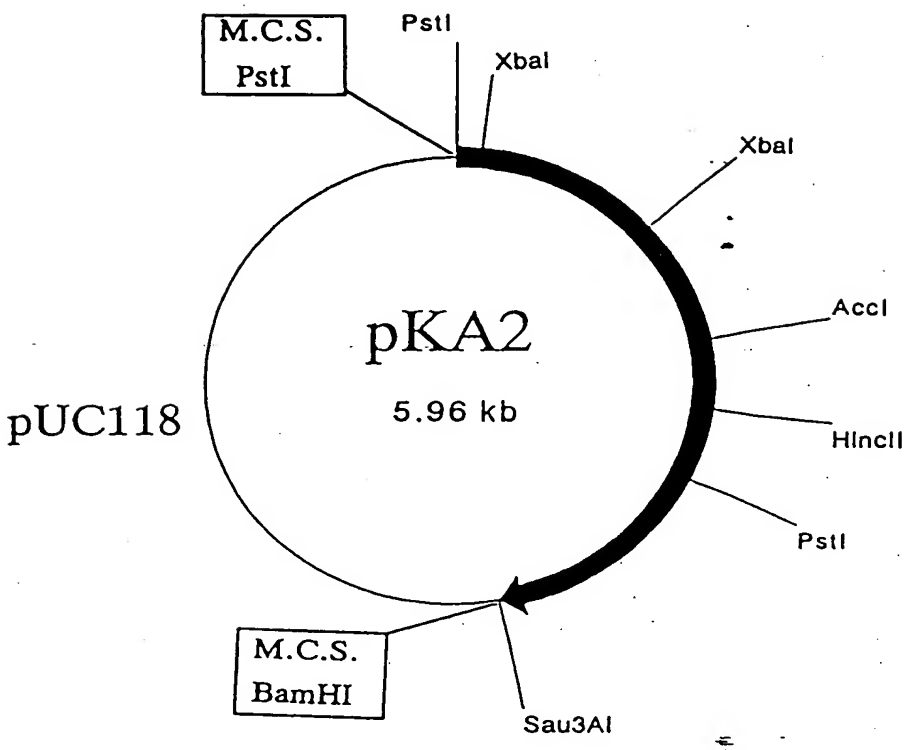

M.C.S.
PstI
PstI
XbaI
XbaI
AccI
HincII
PstI
M.C.S.
BamHI
Sau3AI
pKA2
5.96 kb
pUC118

FIG. 35

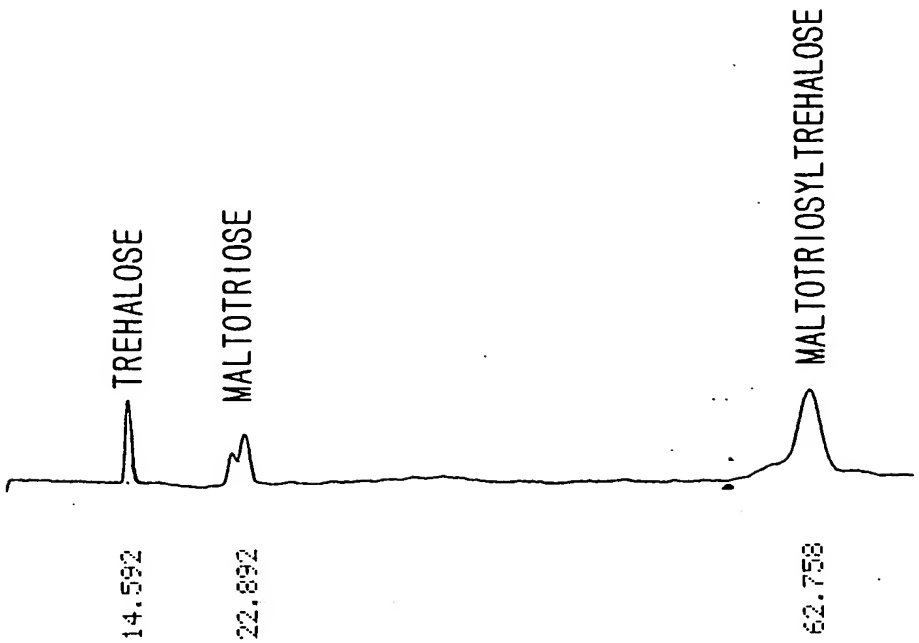


FIG. 36A

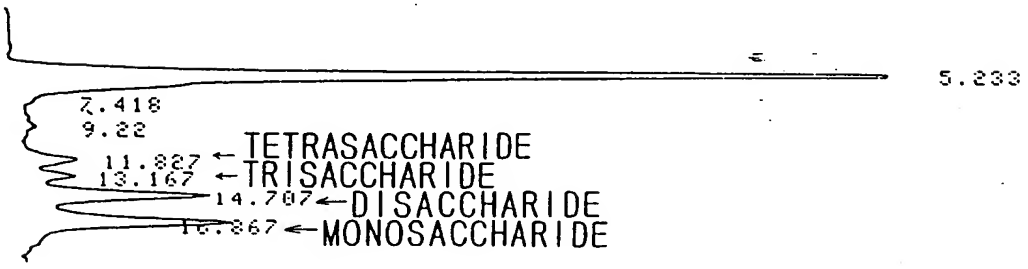


FIG. 36B

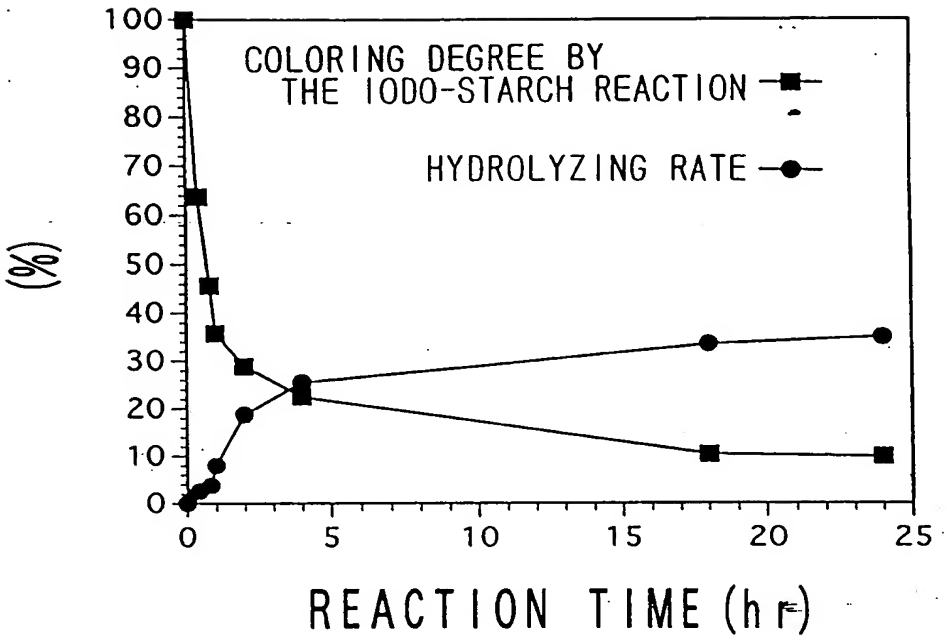

100
90
80
70
60
50
40
30
20
10
0
(%)
COLORING DEGREE BY
THE IODO-STARCH REACTION
HYDROLYZING RATE
0
5
10
15
20
25
REACTION TIME (hr)

FIG. 37

p09A1 INSERTED FRAGMENT

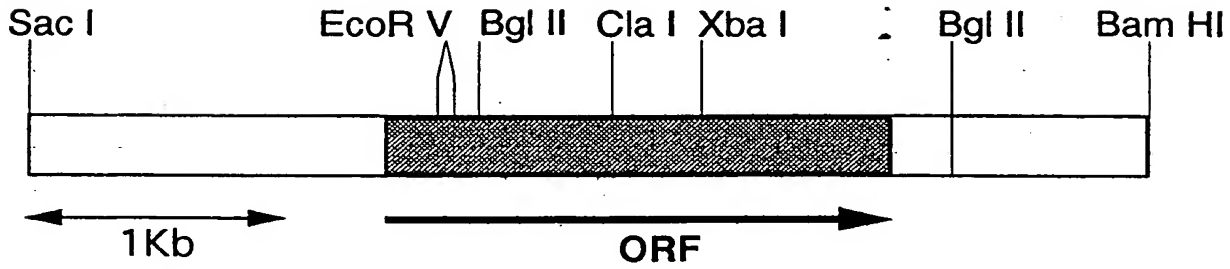


FIG. 38

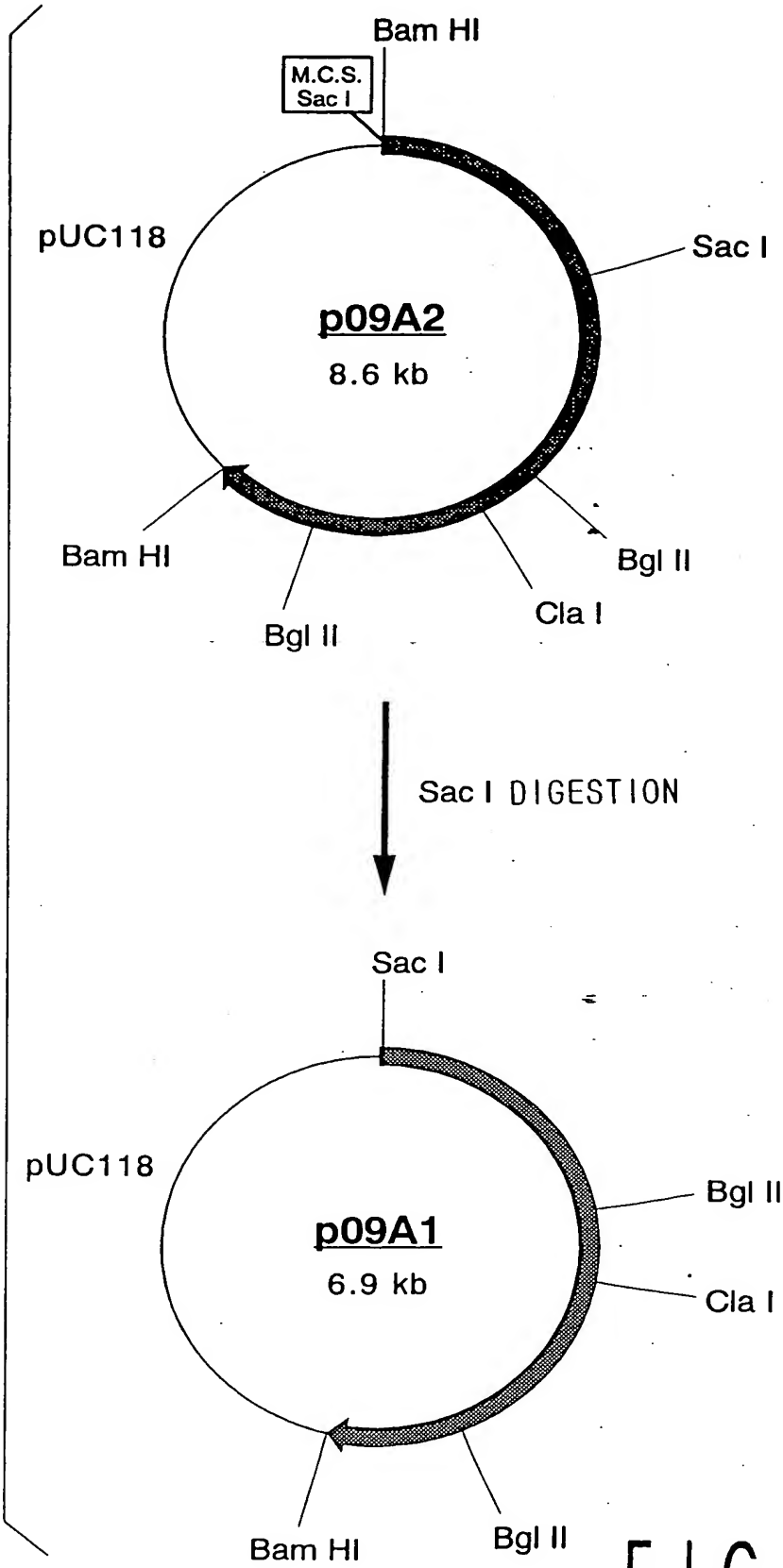

Bam HI
M.C.S.
Sac I
pUC118
Sac I
p09A2
8.6 kb
Bam HI
Bgl II
Bgl II
Cla I
Sac I DIGESTION
Sac I
pUC118
Bgl II
p09A1
6.9 kb
Cla I
Bam HI
Bgl II

FIG. 39

```
  1' MFSFGGNIEKNKGIFKLWAPYVNSVKLK-LSKKLIPMEKNDEGFFEVEIDDIEENLTYSY
     .*. .*. *. **.***** .***** *.* *  **....*.*........ .  *.*
  1"   TFAYKIDGNEVIFTLWAPYQKSVKLKVLEKGLYEMERDEKGYFTITLNNVKVRDRYKY

 60' IIEDKREIPDPASRYQPLGVHDKSQLIRTDYQILDLGKVKIEDLIIYELHVGTFSQEGNF
     ...* .********** ***. **.*... .. . . .* *******.*****..**.*
 59" VLDDASEIPDPASRYQPEGVHGPSQIIQESKEFNNETFLKKEDLIIYEIHVGTFTPEGTF

120' KGVIEKLDYLKDLGITGIELMPVAQFPGNRDWGYDGVFLYAVQNTYGGPWELAKLVNEAH
     .*** **********.**.**.*****.********.******.****  ..  ***.***
119" EGVIRKLDYLKDLGITAIEIMPIAQFPGKRDWGYDGVYLYAVQNSYGGPEGFRKLVDEAH

180' KRGIAVILDVVYNHIGPEGNYLLGLGPYFSDRYKTPWGLTFNFDDRGCDQVRKFILENVE
     *.*..*********.******.. ******..************ ..*.**********
179" KKGLGVILDVVYNHVGPEGNYMVKLGPYFSQKYKTPWGLTFNFDDAESDEVRKFILENVE

240' YWFKTFKIDGLRLDAVHAIFDNSPKHILQEIAEKAHQLGKFVIAESDLNDPKIV--KDDC
     **.*....**.********.*.******.***. .*. ...**********..*  *.:*
239" YWIKEYNVDGFRLDAVHAIIDTSPKHILEEIADVVHKYNRIVIAESDLNDPRVVNPKEKC

298' GYKIDAQWVDDFHHAVHAFITKEKDYYYQDFGRIEDIEKTFKDVFVYDGKYSRYRGRTHG
     **.**********..**..* *.. ** ***...** *..**********..* .***
299" GYNIDAQWVDDFHHSIHAYLTGERQGYYTDFGNLDDIVKSYKDVFVYDGKYSNFRRKTHG

358' APVGDLPPRKFVVFIQNHDQVGNRGNGERLSILTDKTTYLMAATLYILSPYIPLIFMGEE
     .***.*   .***.**********.***.  *.*...* .**.**.******.******
359" EPVGELDGCNFVVYIQNHDQVGNRGKGERIIKLVDRESYKIAAALYLLSPYIPMIFMGEE

418' YYETNPFFFFSDFSDPVLIKGVREGRLKENNQMIDPQSEEAFLKSKLSWKIDEEVLDYYK
     * *.***.*******. **.****** ***.* .***.*..*  **********....**
419" YGEENPFYFFSDFSDSKLIQGVREGRKKENGQDTDPQDESTFNASKLSWKIDEEIFSFYK

478' QLINIRKRYN-NCKRVKEVRREGNCITLIMEKIGIIASFDDIVINSKITGNLLIGI--GF
     **..**  . .*.*  .*  ...* ...  .  .  *..  *. * .*.**..   .*
479" ILIKMRKELSIACDRRVNVVNGENWLIIKGREYFSLYVFSKSSIEVKYSGTLLLSSNNSF

535' PKKLKKDELIKVNRGVGVYQLE
     *........  . ..* ..*.*
539" PQHIEEGK-YEFDKGFALYKL
```

FIG. 40


1176' ATGTTTTCGTTCGGTGGAAATATTGAAAAAAATAAAGGTATCTTTAAGTTATGGGCACCT
642" ACGTTTGCTTATAAAATAGATGGAAATGAGGTAATCTTTACCTTATGGGCACCT
1236' TATGTTAATAGTGTTAAGCTGAA-GTT--AAGCAAAAAACTTATTCCAATGGAAAAAAAC
696" TATCAAAAGAGCGTTAAACTAAAGGTTCTAGAGAAGGGACTTTACGAAATGGAAAGAGAT
1293' GATGAGGGATTTTTCGAAGTAGAAATAGACGATATCGAGGAAAATTTAACCTATTCTTAT
756" GAAAAAGGTTACTTCACCATTACCTTAAACAACGTAAAGGTTAGAGATAGGTATAAATAC
1353' ATTATAGAAGATAAGAGAGAGATACCTGATCCCGCATCACGATATCAACCTTTAGGAGTT
816" GTTTTAGATGATGCTAGTGAAATACCAGATCCAGCATCCAGATACCAACCAGAAGGTGTA
1413' CATGACAAATCACAACTTATAAGAACAGATTATCAGATTCTTGACCTTGGAAAAGTAAAA
876" CATGGGCCTTCACAAATTATACAAGAAAGTAAAGAGTTCAACAACGAGACTTTTCTGAAG
1473' ATAGAAGATCTAATAATATATGAACTCCACGTTGGTACTTTTTCCCAAGAAGGAAATTTC
936" AAAGAGGACTTGATAATTTATGAAATACACGTGGGGACTTTCACTCCAGAGGGAACGTTT
1533' AAAGGAGTAATAGAAAAGTTAGATTACCTCAAGGATCTAGGAATCACAGGAATTGAACTG
996" GAGGGAGTGATAAGGAAACTTGACTACTTAAAGGATTTGGGAATTACGGCAATAGAGATA
1593 ATGCCTGTGGCACAATTTCCAGGGAATAGAGATTGGGGATACGATGGTGTTTTTCTATAC
1056" ATGCCAATAGCTCAATTTCCTGGGAAAAGGGATTGGGGTTATGATGGAGTTTATTTATAT
1653' GCAGTTCAAAATACTTATGGCGGACCATGGGAATTGGCTAAGCTAGTAAACGAGGCACAT
1116" GCAGTACAGAACTCTTACGGAGGGCCAGAAGGTTTTAGAAAGTTAGTTGATGAAGCGCAC
1713' AAAAGGGGAATAGCCGTAATTTTGGATGTTGTATATAATCATATAGGTCCTGAGGGAAAT
1176" AAGAAAGGTTTAGGAGTTATTTTAGACGTAGTATACAACCACGTTGGACCAGAGGGAAAC
1773' TACCTTTTAGGATTAGGTCCTTATTTTTCAGACAGATATAAAACTCCATGGGGATTAACA
1236" TATATGGTTAAATTGGGGCCATATTTCTCACAGAAATACAAAACGCCATGGGGATTAACC
1833' TTTAATTTTGATGATAGGGGATGTGATCAAGTTAGAAAATTCATTTTAGAAAATGTCGAG
1296" TTTAACTTTGACGATGCTGAAAGCGATGAGGTTAGGAAGTTCATCTTAGAAAACGTTGAG
1893' TATTGGTTTAAGACCTTTAAAATCGATGGTCTGAGACTGGATGCAGTTCATGCAATTTTT
1356" TACTGGATTAAGGAATATAACGTTGATGGGTTTAGATTAGATGCGGTTCATGCAATTATT
1953' GATAATTCGCCTAAGCATATCCTCCAAGAGATAGCTGAAAAAGCCCATCAATTAGGAAAA
1416" GACACTTCTCCTAAGCACATCTTGGAGGAAATAGCTGACGTTGTGCATAAGTATAATAGG
2013' TTTGTTATTGCTGAAAGTGATTTAAATGATCCAAAAATAG-TAA-----AAGATGATTGT
1476" ATTGTCATAGCCGAAAGTGATTTAAACGATCCTAGAGTCGTTAATCCCAAGGAAAAGTGT
2067' GGATATAAAATAGATGCTCAATGGGTTGACGATTTCCACCACGCAGTTCATGCATTCATA
1536" GGATATAATATTGATGCTCAATGGGTTGACGATTTCCATCATTCTATTCACGCTTACTTA
2127' ACAAAAGAAAAAGATTATTATTACCAGGATTTTGGAAGGATAGAAGATATAGAGAAAACT
1596" ACTGGTGAGAGGCAAGGCTATTATACGGATTTCGGTAACCTTGACGATATAGTTAAATCG

FIG. 41A

```
2187' TTTAAAGATGTTTTTGTTTATGATGGAAAGTATTCTAGATACAGAGGAAGAACTCATGGT
      * *** ** ***** ** ******** ***** ** *  *  *** *** ****** **
1656" TATAAGGACGTTTTCGTATATGATGGTAAGTACTCCAATTTTAGAAGAAAAACTCACGGA

2247' GCTCCTGTAGGTGATCTTCCACCACGTAAATTTGTAGTCTTCATACAAAATCACGATCAA
      *  ** ** ***** **        * * ** ** ***** *  ******************
1716" GAACCAGTTGGTGAACTAGACGGATGCAATTTCGTAGTTTATATACAAAATCACGATCAA

2307' GTAGGAAATAGAGGAAATGGGGAAAGACTTTCCATATTAACCGATAAAACGACATACCTT
      ** ********** ** ** ****** *    * ****  *****       *  ***
1776" GTCGGAAATAGAGGCAAAGGTGAAAGAATAATTAAATTAGTCGATAGGGAAAGCTACAAG

2367' ATGGCAGCCACACTATATATACTCTCACCGTATATACCGCTAATATTTATGGGCGAGGAA
      ** ** **  * ** **  * ** ** ** ***** **  * ** ** ***** ******
1836" ATCGCTGCAGCCCTTTACCTTCTTTCCCCCTATATTCCAATGATTTTCATGGGAGAGGAA

2427' TATTATGAGACGAATCCTTTTTTCTTCTTCTCTGATTTCTCAGATCCCGTATTAATTAAG
      **   ****  ***** **** ***** ******** ****** *  *  * ** *
1896" TACGGTGAGGAAAATCCCTTTTATTTCTTTTCTGATTTTTCAGATTCAAAACTGATACAA

2487' GGTGTTAGAGAAGGTAGACTAAAGGAAAATAATCAAATGATAGATCCACAATCTGAGGAA
      ***** ** ***** ***  ********** ***  *  ** ** ***  ***  *
1956" GGTGTAAGGGAAGGGAGAAAAAAGGAAAACGGGCAAGATACTGACCCTCAAGATGAATCA

2547' GCGTTCTTAAAGAGT--AAACTTTCATGGAAAATTGATGAGGAAGTTTTAGATTATTATA
      *  * **** *  *  *****    ***** ***** ****** * **    * *** *
2016" AC--TTTTAACGCTTCCAAACTGAGTTGGAAGATTGACGAGGAAATCTTTTCATTTTACA

2605' AACAACTGATAAATATCAGAAA-GAGAT-ATAATA-ATTGTAAAAGGGTAAAGGAAGTTA
      *     * ***** ** ***** *** * *  ***   *** * ***  *    * **
2074" AGATTTTAATAAAAATGAGAAAGGAGTTGAGCATAGCGTGTGATAGGAGAGTAAACGTCG

2662' GGAGAGAAGGGAACTGTATTACTTTGATCATGGAAAAAATAGGAATAATTGCATCGTTTG
      **  *  *  ** **  * *    * *     * * * ****     * * *  *   ***
2134" TGAATGGCGAAAATTGGTTGATCATCAAGG-GAAGAGAATACTTTTCACTCTACGTTTTC

2722' ATGATATTGT-AATTAATTCTAAAATTACAGGTAATTTACTTATAGGCATAGGATTTCCG
        * **  *  *** *   ***     *  ** * ******* *   *  *     * *
2193" TCTAAATCATCTATTGAAGTTAAGTACAGTGGAACTTTACTTTTGTCCTCAAATAATTCA

2781' AAAAAATTGAAAAAAGATGAA--TTAAT-TAAGGTTAACAGAGGTGTTGGGGTATATCAA
            * * *  ** ***  * *** * ** ** * *  **  ***   ***** **
2253" TTCCCTCAGCATATTGAAGAAGGTAAATATGAGTTTGATAAGGGATTTGCTTTATATAAA

2838' TTAGAA
      *
2313" CTT
```

FIG. 41B

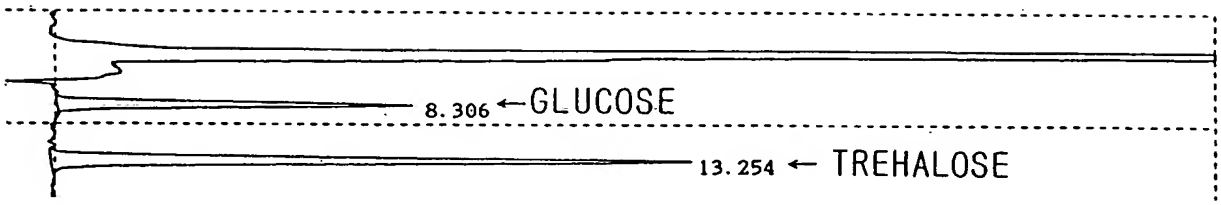


FIG. 42